

Site Selection For The Expansion Of The Strategic Petroleum Reserve Draft Environmental Impact Statement

VOLUME 1 Summary and Chapters 1 - 7

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Draft Environmental Impact Statement for Site Selection for the Expansion of the Strategic Petroleum Reserve Document No. DOE/EIS-0385

Responsible Federal Agency: U.S. Department of Energy (DOE), Office of Petroleum Reserves

Location: Potential new SPR storage sites are located in Lafourche Parish, Louisiana; Perry and Claiborne Counties, Mississippi; and Brazoria County, Texas. Existing Strategic Petroleum Reserve (SPR) storage sites that could be expanded are located in Cameron, Calcasieu, and Iberville Parishes, Louisiana; and Jefferson County, Texas. Associated pipelines, marine terminals, and other facilities that might be developed are located in East Baton Rouge, East Feliciana, St. James, Terrebonne, West Baton Rouge, and West Feliciana Parishes, Louisiana; Adams, Amite, Forrest, George, Greene, Hinds, Jackson, Jefferson, Lamar, Lincoln, Marion, Pike, Warren, Walthall, and Wilkinson Counties, Mississippi; and Galveston County, Texas.

Contacts

For additional information on this draft environmental impact statement (EIS), contact:

Mr. Don Silawsky
Office of Petroleum Reserves, FE-47
U.S. Department of Energy
Washington, DC 20585-0301
Telephone: (202) 586-1892
Fax: (202) 586-4446
Email: Donald.Silawsky@hq.doe.gov

For general information on DOE's National Environmental Policy Act process, write or call:
Ms. Carol M. Borgstrom, Director
Office of NEPA Policy and Compliance, EH-42
U.S. Department of Energy
Washington, DC 20585-0119
Telephone: (202) 586-4600, or leave a message
at: 800-472-2756
Fax: (202) 586-7031
Email: askNEPA@eh.doe.gov

Abstract: As required by the Energy Policy Act of 2005 (P.L. 109-58), DOE would expand the SPR to its full authorized 1 billion-barrel capacity by selecting additional storage sites. DOE would develop one new site or a combination of two new sites, and would expand capacity at two or three existing sites. Storage capacity would be developed by solution mining of salt domes and disposing of the resulting salt brine by ocean discharge or underground injection. New pipelines, marine terminal facilities, and other infrastructure could also be required.

DOE has determined that site selection and expansion constitute a major Federal action within the meaning of the National Environmental Policy Act of 1969, as amended (42 USC 4321-4347). The *Federal Register* "Notice of Intent to Prepare an Environmental Impact Statement and Conduct Public Scoping Meetings; Site Selection for the Expansion of the Strategic Petroleum Reserve" was published on September 1, 2005 (70 FR 52088). See also the subsequent notices to extend the public scoping period and reschedule public meetings (70 FR 56649, September 28, 2005 and 70 FR 70600, November 22, 2005). DOE held public scoping meetings on October 11, 2005, in Lake Jackson, Texas; on October 17, 2005, in Jackson, Mississippi; on October 18, 2005, in Houma, Louisiana; and on December 7, 2005, in Port Gibson, Mississippi. DOE also solicited written comments on the scope of the EIS in the Notice of Intent.

DOE has prepared this draft EIS to address the environmental impacts of the proposed expansion of the capacity of the Strategic Petroleum Reserve and the range of reasonable alternatives, including the "No Action" alternative, under which SPR storage capacity would not be expanded. DOE will use the draft EIS to ensure that it has the information needed for purposes of informed decision-making. DOE's decisions will be issued subsequent to the Final EIS, in the form of a Record of Decision, no sooner than 30 days after publication of the Notice of Availability of the final EIS.

Public Comments: Locations and times of public hearings on this draft EIS will be announced in the *Federal Register* on May 26, 2006. Comments on this Draft EIS will be accepted for a period of 45 days following its issuance and will be considered in the preparation of the final EIS. Any comments received later will be considered to the extent practicable.

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Summary

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Summary

S.1 BACKGROUND

The Strategic Petroleum Reserve (SPR) is a national stockpile of petroleum (crude oil). Following the 1973-74 oil embargo, SPR was established pursuant to the Energy Policy and Conservation Act of 1975 to protect the United States from interruption in petroleum supplies that would be detrimental to our energy security, national security, and economy. The SPR currently consists of four underground oil storage facilities along the Gulf Coast—two in Louisiana (Bayou Choctaw and West Hackberry) and two in Texas (Big Hill and Bryan Mound)—and an administrative facility in New Orleans, LA. At the storage facilities, crude oil is stored in caverns constructed by the solution mining of rock salt formations (salt domes). The four SPR facilities have a combined current storage capacity of 727 million barrels (MMB) and an inventory of 688 MMB as of May 4, 2006.

If the United States is confronted with an economically-threatening disruption in oil supplies, the President can use the SPR as an emergency response tool, transferring oil from the SPR into the commercial oil distribution systems. The SPR has been used twice under these conditions. First, at the beginning of Operation Desert Storm in 1991, the United States joined its allies in assuring the adequacy of global oil supplies when war broke out in the Persian Gulf. An emergency sale of SPR crude oil was announced the day the war began. The second instance was in September 2005 after Hurricane Katrina devastated the oil production, distribution, and refining industries in the Gulf regions of Louisiana and Mississippi. In addition to national energy emergencies, crude oil has been withdrawn many times from the SPR sites for other reasons. Small quantities of oil are routinely pumped from the storage caverns to test the reserve's equipment. In addition, oil has been removed from the caverns under the legal authority to "exchange" SPR crude oil with private companies by which the SPR ultimately receives more oil than it released.

The U.S. Department of Energy (DOE) conducted planning activities for the expansion of the SPR to 1 billion barrels under prior congressional directives in 1988 and 1990. The expansion planning directive in 1988 resulted in an initial plan entitled *Report to Congress on Expansion of the Strategic Petroleum Reserve to One Billion Barrels*. The expansion planning directive in 1990 likewise resulted in a *Report to Congress on Candidate Sites for Expansion of the Strategic Petroleum Reserve to One Billion Barrels* and the preparation of a *Draft Environmental Impact Statement on the Expansion of the Strategic Petroleum Reserve, DOE/EIS-0165-D* in 1992, which assessed five candidate sites for the expansion of the SPR to 1 billion barrels: Big Hill, TX; Stratton Ridge, TX; Weeks Island, LA; Cote Blanche, LA; and Richton, MS. DOE/EIS-0165-D is available on the DOE Fossil Energy Web site at <http://www.fossil.energy.gov/programs/reserves/spr/expansion-eis.html>. Prior to completion of the final EIS, DOE notified Congress that due to the existence of a large unfilled capacity in the SPR, DOE would be deferring any site selection decisions and expansion of the SPR until such time that oil fill of the SPR supported the need for further capacity development.

S.2 PURPOSE AND NEED

On August 8, 2005, the President signed the Energy Policy Act of 2005 (EPACT). Section 303 of EPACT states that:

“Not later than 1 year after the date of enactment of this Act, the Secretary shall complete a proceeding to select, from sites that the Secretary has previously studied, sites necessary to enable acquisition by the Secretary of the full authorized volume of the Strategic Petroleum Reserve.”

Thus, the purpose and need for agency action is to select and develop the sites to expand SPR capacity from 727 MMB to 1 billion barrels, that is, to add 273 MMB of capacity.

S.3 PROPOSED ACTION AND ALTERNATIVES

EPACT Section 303 states that in evaluating sites for SPR expansion, DOE:

[s]hall first consider and give preference to the five sites which the Secretary previously addressed in the Draft Environmental Impact Statement, DOE/EIS-0165-D. However, the Secretary, in his discretion may select other sites as proposed by a State where a site has been previously studied by the Secretary to meet the full authorized volume of the Strategic Petroleum Reserve [1 billion barrels].”

EPACT Section 301(e) directs the Secretary to “... acquire petroleum in quantities sufficient to fill ...” the SPR to 1 billion barrels. Consistent with these mandates, DOE’s proposed action is to develop one or two new SPR sites, to expand petroleum storage capacity at two or three existing SPR sites, and to fill the SPR to its full authorized volume of 1 billion barrels. Sections S.3.1 and S.3.2 of this Summary of the draft Environmental Impact Statement (EIS) describe the potential development of new SPR sites and the potential expansion of existing SPR sites, respectively. Section S.3.3 identifies the alternatives considered in the draft EIS, which are a combination of one or two new sites and two or three expansion sites. Section S.3.4 presents background information on SPR construction and operations. Sections S.3.5, S.3.6, and S.3.7 discuss the potential new sites and associated infrastructure, the potential expansion sites and associated infrastructure, and the no-action alternative, respectively.

S.3.1 Potential New Sites

As required by EPACT Section 303, DOE has limited its review of potential new sites for expansion of the SPR to: (1) sites that DOE addressed in the 1992 draft EIS and (2) sites proposed by a state where DOE has previously studied a site. The following five potential new sites meet those conditions and are considered in this draft EIS:

- Richton, MS, and Stratton Ridge, TX, which were addressed in the 1992 draft EIS;
- Clovelly and Chacahoula, LA, which the Governor of Louisiana requested the Secretary of Energy consider; and
- Bruinsburg, MS, which the Governor of Mississippi requested that the Secretary of Energy consider.

While the 1992 draft EIS addressed the potential new salt dome sites at Cote Blanche, LA, and Weeks Island, LA, DOE’s preliminary review of these sites for this draft EIS concluded that they are no longer viable due to the sale of the DOE’s Weeks Island crude oil pipeline and its subsequent conversion to natural gas transmission.

S.3.2 Potential Expansion Sites

In addition to potential new sites, this draft EIS considers expanding the following three existing SPR sites:

- Big Hill, TX, which was addressed in the 1992 draft EIS; and
- Bayou Choctaw and West Hackberry, LA, which the Governor of Louisiana requested that the Secretary of Energy consider.

Figure S.3.2-1 shows the location of the proposed new and expansion sites.

S.3.3 Alternatives

In developing the range of reasonable alternatives to fulfill its proposed action, DOE first considered expansions of the three existing storage sites, which would capitalize on existing site infrastructure and operations and thereby minimize development time and construction and operations costs. DOE, however, cannot reach its goal of 273 MMB simply by expanding capacity at existing sites. The amount of new capacity that can be developed at each existing site is limited by the physical size of the salt dome, the site's infrastructure for cavern development, the capacity of the commercial petroleum distribution infrastructure to handle an increased rate of oil withdrawal from the site, and other constraints. DOE has determined that, at most, it could create up to 153 MMB of new capacity by expanding existing SPR sites: DOE's site at Bayou Choctaw, LA, could be expanded by up to 30 MMB; Big Hill, TX, by up to 108 MMB; and West Hackberry, LA, by up to 15 MMB. Accordingly, DOE must develop one or more new SPR storage sites to meet its 273 MMB target and the alternatives discussed below are various proposals for combinations of expanded sites and new sites.

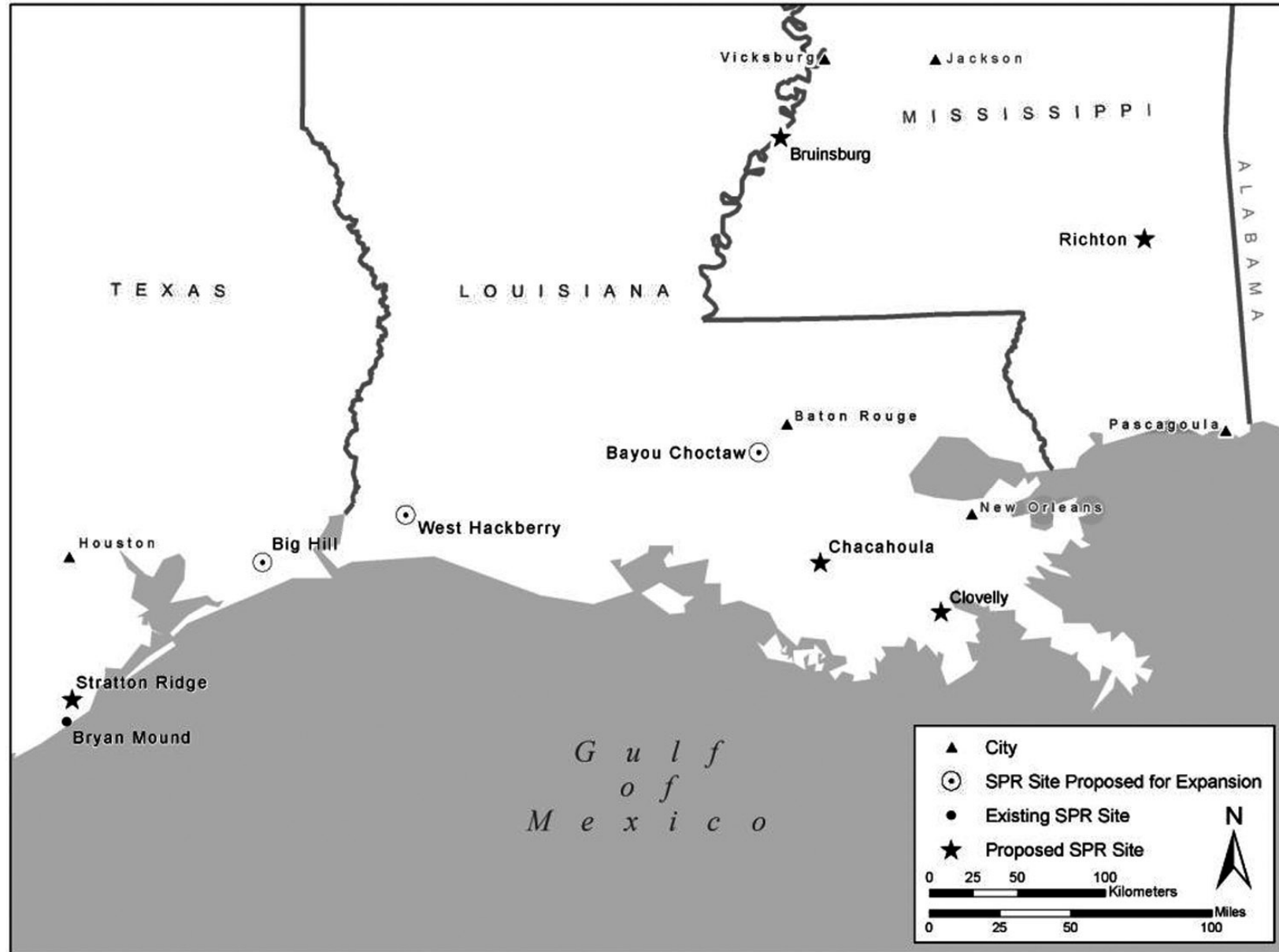
In examining potential new sites, DOE proposes to develop a new site with a capacity of 160 MMB, which is necessary to provide the capability to store two types of crude oil and support a drawdown rate of 1 million barrels per day. Five potential new sites have been designated for consideration in this draft EIS: Bruinsburg, MS; Chacahoula, LA; Clovelly, LA; Richton, MS; and Stratton Ridge, TX. All sites but Clovelly have the capability to provide 160 MMB of storage capacity. The Clovelly site is constrained to a maximum of 120 MMB by both the size of the salt dome and the existing commercial salt cavern storage operation on the dome. Due to the small size of the salt domes at Clovelly and Bruinsburg, DOE considers not only alternatives where Clovelly or Bruinsburg is the only new SPR site, but also alternatives with capacity at both Clovelly and Bruinsburg. From these various possibilities, DOE proposes the following alternatives set forth in table S.3.3-1 below.

Table S.3.3-1: Alternatives

| New Sites and Capacity | Expansion Sites and Added Capacity | Total New Capacity* |
|---------------------------------------|--|--------------------------|
| Clovelly, LA (120 MMB) | 153 MMB Bayou Choctaw (30 MMB) Big Hill (108 MMB) West Hackberry (15 MMB) | 273 MMB |
| Bruinsburg, MS (160 MMB) | 115 MMB Bayou Choctaw (20 MMB) Big Hill (80 MMB) West Hackberry (15 MMB) | 275 MMB or 276 MMB |
| Chacahoula, LA (160 MMB) | OR | |
| Clovelly (80MMB)/Bruinsburg (80 MMB) | 116 MMB | |
| Richton, MS (160 MMB) | Bayou Choctaw (20 MMB) Big Hill (96 MMB) | 277 MMB or 274 MMB |
| Stratton Ridge, TX (160 MMB) | 107 MMB Bayou Choctaw (20 MMB) Big Hill (72 MMB) West Hackberry (15 MMB) | |
| Clovelly (90 MMB)/Bruinsburg (80 MMB) | OR 104 MMB Bayou Choctaw (20 MMB) Big Hill (84 MMB) | |
| No-action alternative | None | None |

* DOE would not fill the SPR beyond 1 billion barrels if it developed more than 273 MMB of new capacity.

Figure S.3.3-1: Existing and Proposed New SPR Facility Locations



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DOE has analyzed the potential impact of its proposed action for each potential location separately. This will permit the public and DOE decision-makers to understand the impacts unique to each site and each combination of sites. In its record of decision, DOE's decision-maker will determine which combination of sites best meets the Department's goal of 273 MMB of additional capacity.

S.3.4 Background on Construction and Operations of SPR Storage Sites

Developing a new SPR storage site generally would include preparing the site; constructing the raw water intake (RWI) and brine-disposal systems, including pipelines; creating caverns; installing oil pipelines to connect to existing petroleum distribution networks; and constructing support structures. Expanding an existing site would involve creating or acquiring additional storage caverns; using or modifying the existing RWI, brine-disposal, and oil-distribution systems; and augmenting support systems.

Site preparation in dry upland areas would involve clearing, grading, stabilization, and compaction. Site preparation in wetlands would include dredging to allow for construction barges and filling to create areas for drill pads, roads, pipelines, buildings, and other structures. A 300-foot (91-meter) security buffer would be cleared around each new site area and new land acquired for expansion.

An RWI system would supply the large amounts of water needed for cavern creation and later oil drawdown. Individual storage caverns would be created in salt domes by solution mining, which would involve pumping raw water into the salt dome, dissolving the salt, pumping out the brine solution, and thereby forming a cavern. The brine solution would be pumped through a pipeline into the Gulf of Mexico or into underground injection wells for disposal.

Site preparation, development of support infrastructure, and construction of pipelines would take four to five years to complete. This would be followed by up to five years of cavern development; therefore, developing a new storage site may take up to 10 years to complete. When a cavern is completed, brine would be pumped out and displaced by crude oil. Crude oil would be stored until drawdown for redistribution through onsite and offsite pipelines and pumps connecting to an existing oil distribution network expanded to include new tank farms, terminals, marine docks, and other equipment.

Prior to brine disposal and crude oil distribution pipeline construction, DOE would clear and grade rights-of-way (ROWs) for pipelines. As needed, DOE would build temporary facilities such as roads and bridges for use during pipeline construction. The methods deployed for pipeline construction would depend on terrain, pipe size, and presence of groundwater and surface water. All pipelines would be buried, except where they would cross levees. Pipelines would require both temporary construction easements and permanent easements. Where feasible, new pipeline ROWs would follow existing ROWs.

In addition, a variety of structures would be needed at each site, including support buildings and enclosures. Power lines would be built along existing ROWs or along ROWs shared with pipelines or roads, where possible, to supply a new SPR storage site and the RWI, brine disposal, and oil distribution systems with the needed electric power.

S.3.5 Potential New Sites and Associated Infrastructure

This section describes the proposed action at each of the proposed new sites in alphabetical order. The following section S.3.6 describes the proposed action at each of the proposed expansion sites in alphabetical order. These sections include a figure for each site that identifies the proposed new or expansion site and its proposed new infrastructure. Table 3.5-1 presents the basic information on the key elements of the proposed action for each proposed new and expansion site.

Bruinsburg, MS

The Bruinsburg salt dome is located in Claiborne County, MS, 10 miles (16 kilometers) west of the town of Port Gibson and 40 miles (64 kilometers) southwest of the city of Vicksburg. Figure S.3.5.1-1 shows the location of the proposed Bruinsburg site and associated pipelines and other infrastructure. The site encompasses a cypress swamp, cotton fields, forested areas, and a bluff overlooking the Mississippi River.

Chacahoula, LA

The Chacahoula salt dome site is located 40 miles (64 kilometers) north of the Gulf of Mexico in northwestern Lafourche Parish, southwest of Thibodaux, LA. Figure S.3.5.2-1 shows the location of the proposed Chacahoula site and associated infrastructure. The site largely lies underwater in wetlands.

Clovelly, LA

The Clovelly storage site would be located east of Galliano, LA, in Lafourche Parish at the site of the Louisiana Offshore Oil Port (LOOP) Clovelly dome storage facility, which is in a wetland area near the coast. The privately owned LOOP complex is designed to accept crude oil from incoming supertankers and includes a marine terminal located 20 miles (32 kilometers) offshore in the Gulf of Mexico. Figure S.3.5.3-1 shows the location of the proposed site.

Clovelly, LA, and Bruinsburg, MS

Under the Clovelly and Bruinsburg joint alternative, DOE would develop 80 or 90 MMB of storage at Clovelly and 80 MMB of storage at Bruinsburg, for a combined development of 160 or 170 MMB of storage capacity. Figure S.3.5.4-1 shows the location of the proposed Bruinsburg 80 MMB site (which would be in the same location as the proposed Bruinsburg 160 MMB site) and infrastructure associated with the Bruinsburg 80 MMB site. The location of the proposed Clovelly facility is the same as shown in figure S.3.5.3-1.

Richton, MS

The Richton site is located in northeastern Perry County, MS, 18 miles (29 kilometers) east of Hattiesburg, MS. Figure S.3.5.5-1 shows the location of the proposed Richton site and associated infrastructure.

Stratton Ridge, TX

The Stratton Ridge salt dome is located in Brazoria County, TX, 3 miles (4.8 kilometers) east of Lake Jackson-Angleton, TX. Figure S.3.5.6-1 shows the location of proposed Stratton Ridge site and associated infrastructure.

Table S.3.5-1: Key Elements of Proposed Action for Each Storage Site and Associated Infrastructure

| Proposed Site | Increased Storage Capacity | Storage Site and Buffer | Water Source | Brine Disposal Facilities | Length of ROWs for New Pipelines, Roads, & Power Lines ^a | Other New Facilities | |
|----------------------|----------------------------|-------------------------|-----------------------------|--|---|---|-----------|
| | | | | | | Facility Type | Size |
| Bruinsburg | 160 MMB in 16 caverns | 365 acres | Mississippi River | 60 new underground injection wells | 230 miles | Terminals/tank farms at Peetsville, MS, and Anchorage, LA | 141 acres |
| Chacahoula | 160 MMB in 16 caverns | 320 acres | Intercoastal Waterway (ICW) | New brine diffuser in Gulf of Mexico | 184 miles | None | -- |
| Clovelly | 120 MMB in 16 caverns | 0 acres ^b | Onsite bayou | Existing brine diffuser in Gulf of Mexico | <1 mile | Off-dome DOE administrative facility | 4 acres |
| Clovelly 80 MMB and | 80 MMB in 12 caverns | 0 acres ^b | Onsite bayou | Existing brine diffuser in Gulf of Mexico | <1 mile | Off-dome DOE administrative facility | 4 acres |
| Bruinsburg 80 MMB | 80 MMB in 8 caverns | 254 acres | Mississippi River | 30 new underground injection wells | 140 miles | Terminal/tank farm at Jackson, MS | 71 acres |
| Clovelly 90 MMB and | 90 MMB in 12 caverns | 0 acres ^b | Onsite bayou | Existing brine diffuser in Gulf of Mexico | <1 mile | Off-dome DOE administrative facility | 4 acres |
| Bruinsburg 80 MMB | 80 MMB in 8 caverns | 254 acres | Mississippi River | 30 new underground injection wells | 140 miles | Terminal/tank farm at Jackson, MS | 71 acres |
| Richton | 160 MMB in 16 caverns | 350 acres | Leaf River | New brine diffuser in Gulf of Mexico | 229 miles | Terminals/tank farms at Liberty, MS, and Pascagoula, MS, and pump station in MS | 130 acres |
| Stratton Ridge | 160 MMB in 16 caverns | 371 acres | ICW | New brine diffuser in Gulf of Mexico | 61 miles | Terminal/tank farm in Texas City, TX | 39 acres |
| Bayou Choctaw 20 MMB | 20 MMB in 2 caverns | 0 acres ^c | Cavern Lake (existing RWI) | Existing and 6 new underground injection wells | 2 miles | None | -- |
| Bayou Choctaw 30 MMB | 30 MMB in 3 caverns | 2 acres ^d | Cavern Lake (existing RWI) | Existing and 6 new underground injection wells | 2 miles | None | -- |
| Big Hill 72 | 72 MMB in 6 caverns | 206 acres | ICW (existing RWI) | Existing brine diffuser in Gulf of Mexico | 24 miles | None | -- |
| Big Hill 80 | 80 MMB in 8 caverns | 206 acres | ICW (existing RWI) | Existing brine diffuser in Gulf of Mexico | 24 miles | None | -- |
| Big Hill 84 | 84 MMB in 7 caverns | 206 acres | ICW (existing RWI) | Existing brine diffuser in Gulf of Mexico | 24 miles | None | -- |
| Big Hill 96 | 96 MMB in 8 caverns | 206 acres | ICW (existing RWI) | Existing brine diffuser in Gulf of Mexico | 24 miles | None | -- |
| Big Hill 108 | 108 MMB in 9 caverns | 206 acres | ICW (existing RWI) | Existing brine diffuser in Gulf of Mexico | 24 miles | None | -- |
| West Hackberry | 15 MMB in 3 caverns | 81 acres ^e | ICW (existing RWI) | Existing underground injection wells | None | None | -- |

1 acre = 0.405 hectares; 1 mile = 1.609 kilometers

^a Length of ROWs that would be used for two or more SPR purposes (e.g., pipelines, roads, and power lines) are counted once.

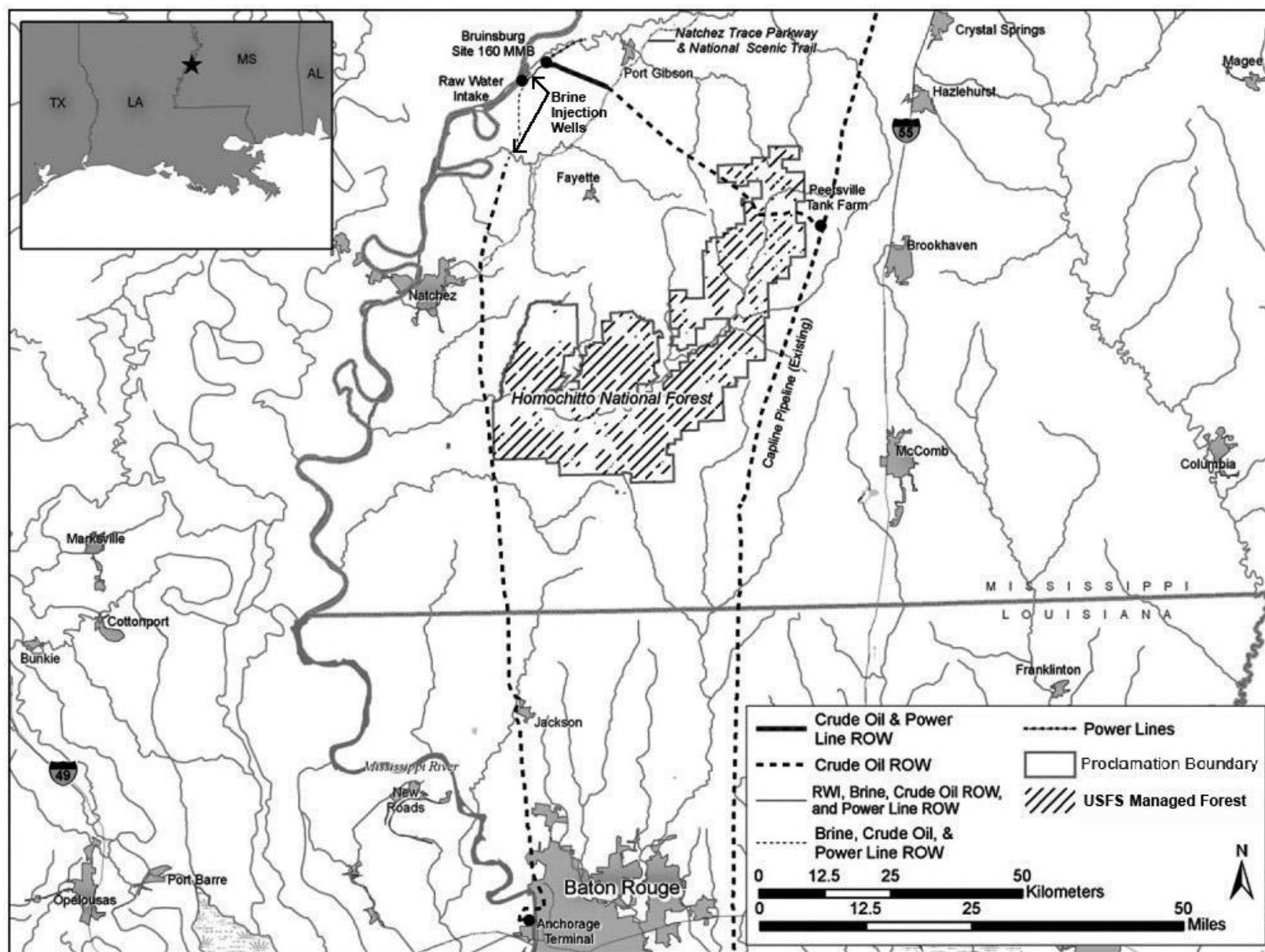
^b New caverns would be built within existing privately owned site.

^c Two new caverns would be on existing SPR land.

^d DOE would purchase one privately owned, existing cavern.

^e DOE also would purchase, but not develop, a 147-acre parcel adjacent to the existing site.

Figure S.3.5.1-1: Proposed Location of Bruinsburg 160 MMB Storage Site and Infrastructure



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Figure S.3.5.2-1: Proposed Location of Chacahoula Storage Site and Infrastructure

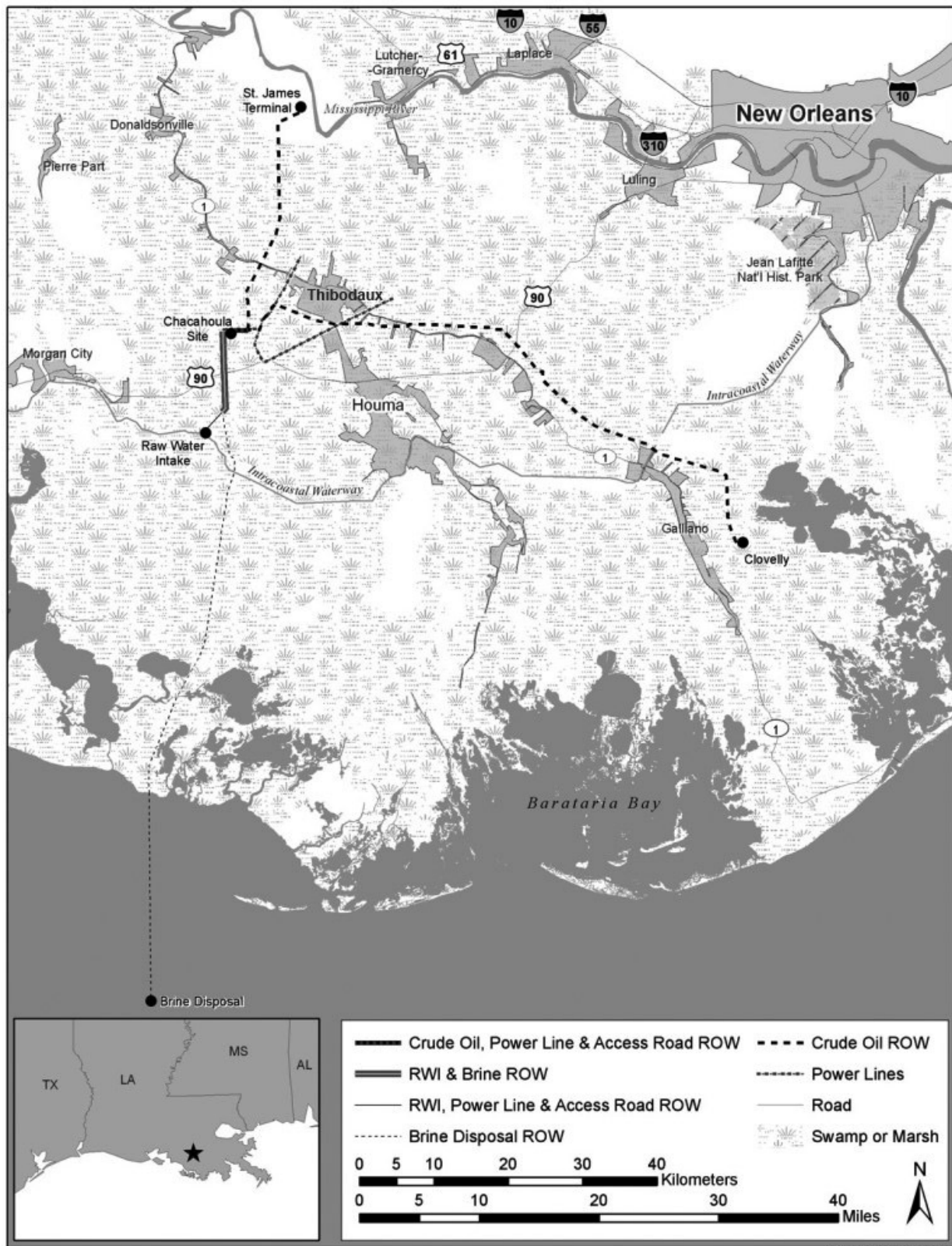
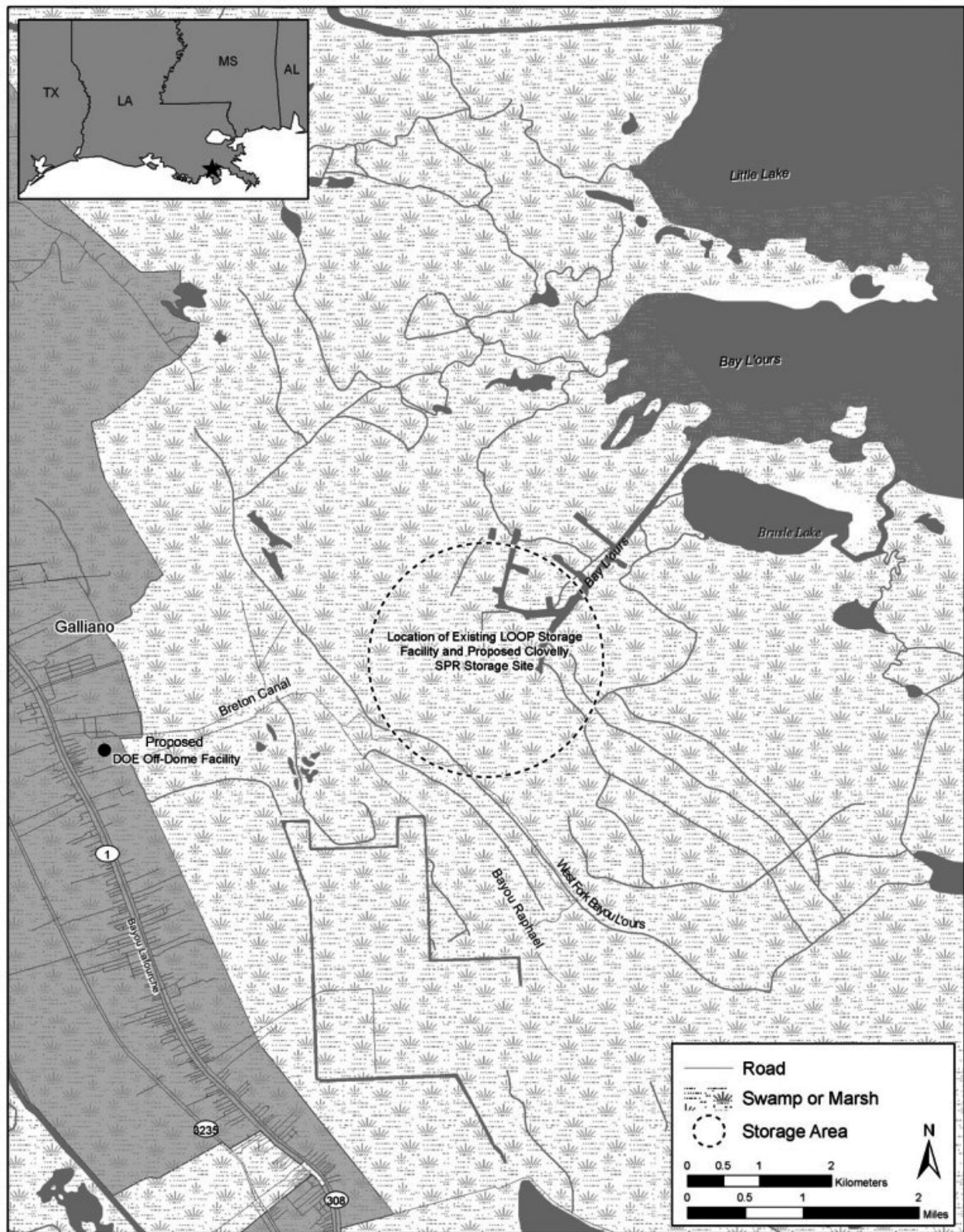
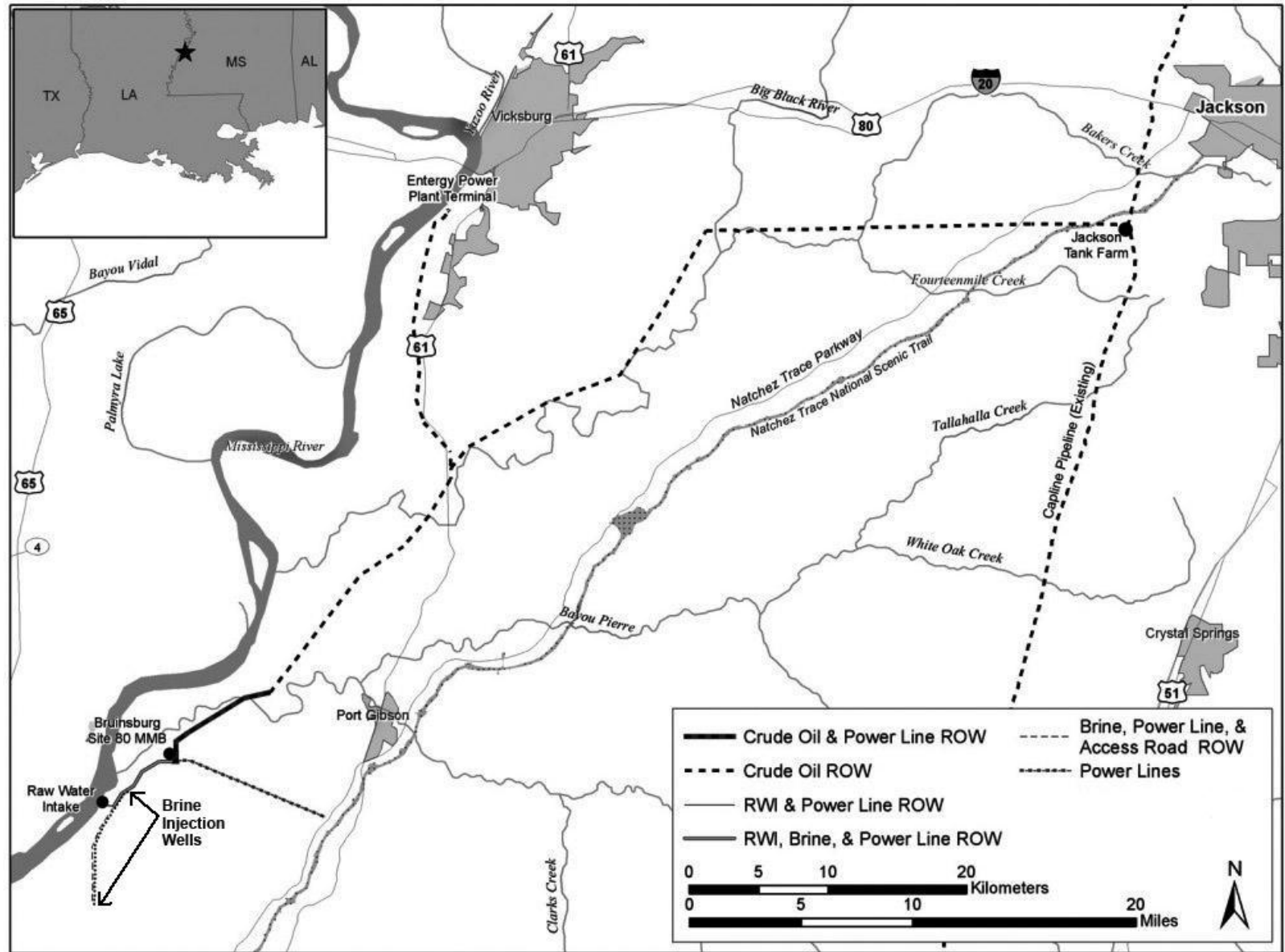


Figure S.3.5.3-1: Proposed Location of Clovelly Storage Site and DOE Facility



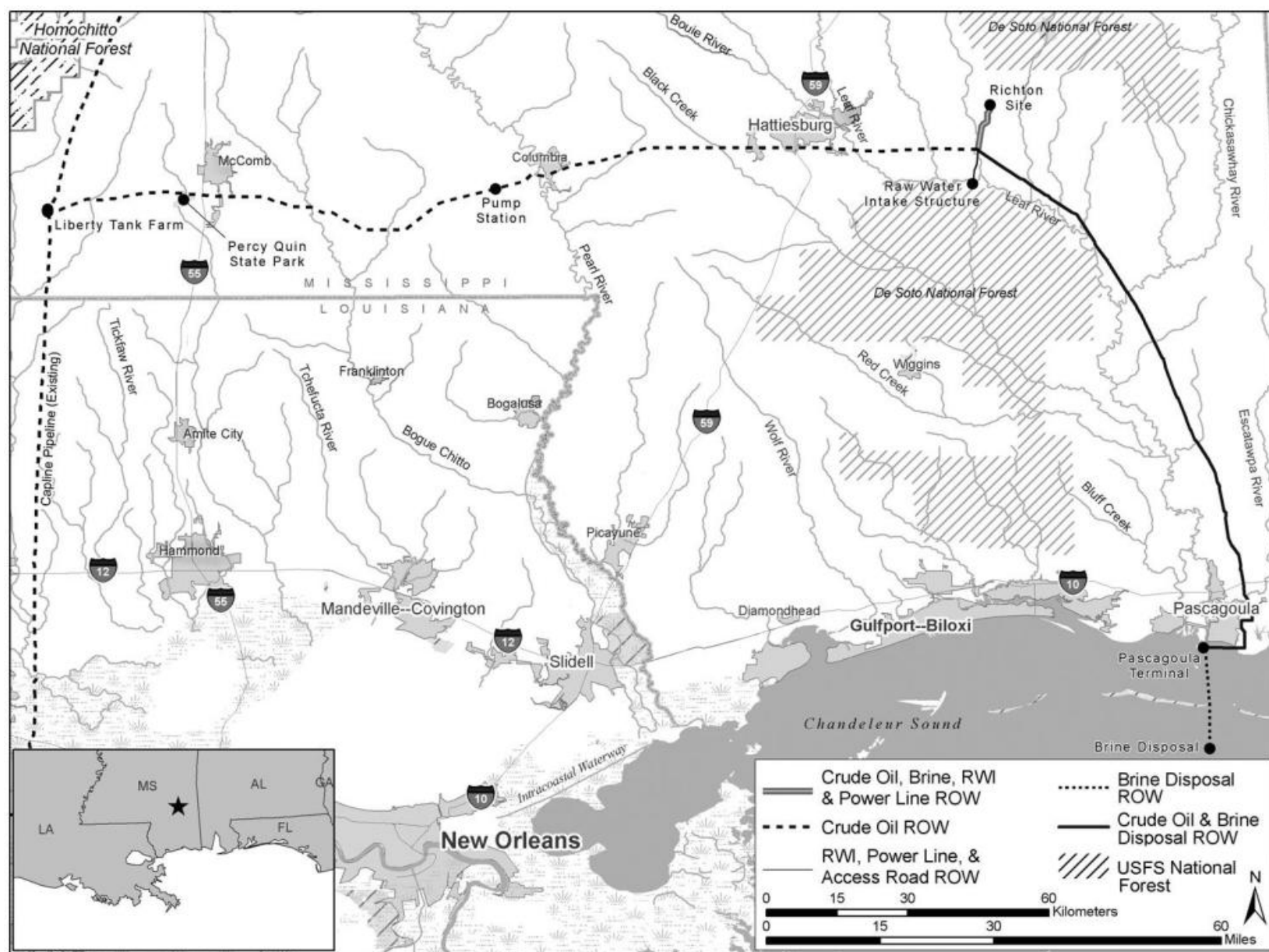
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Figure S.3.5.4-1: Proposed Location of Bruinsburg 80 MMB Storage Site and Infrastructure



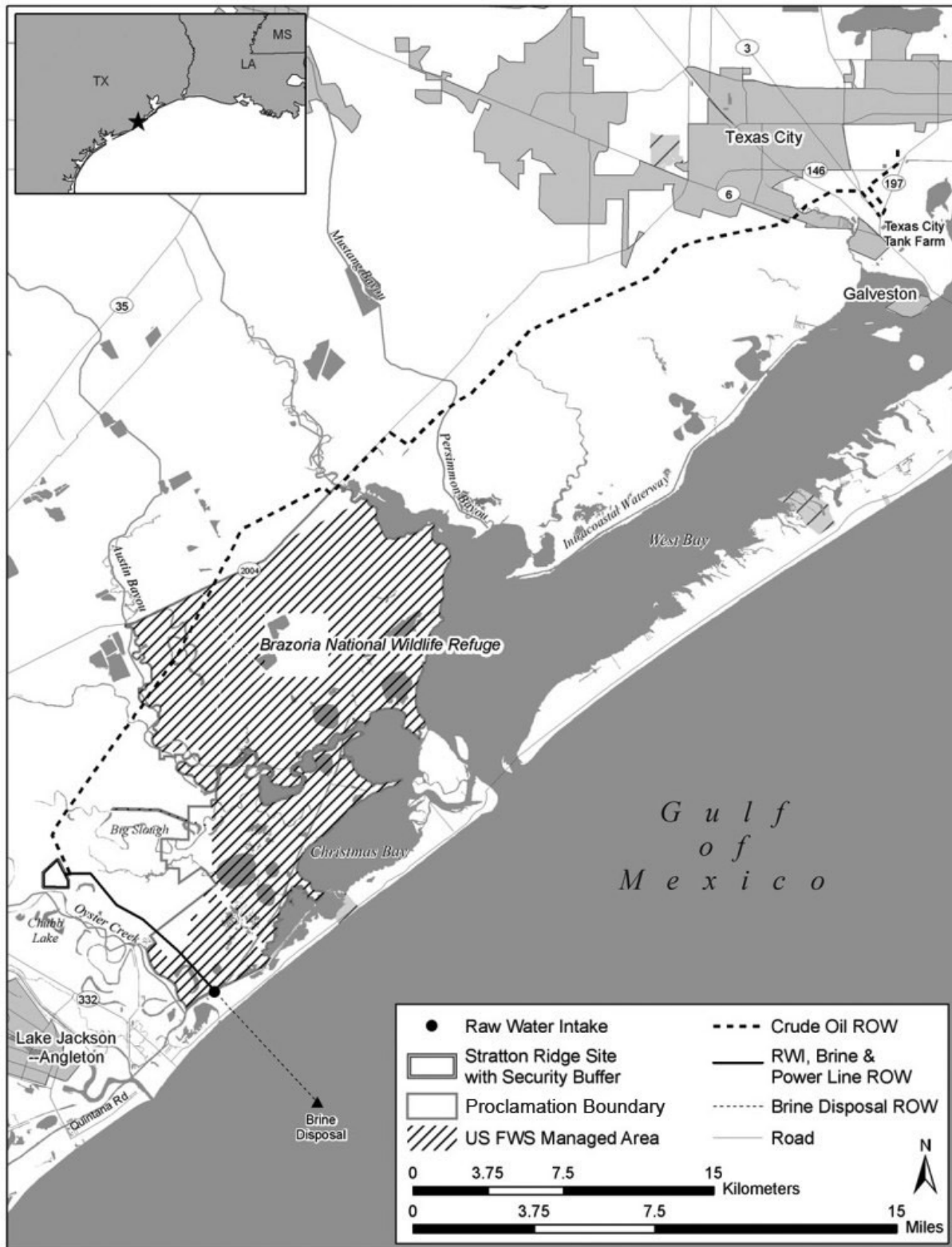
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Figure S.3.5.5-1: Proposed Location of Richton Storage Site and Infrastructure



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Figure S.3.5.6-1: Proposed Location of Stratton Ridge Storage Site and Infrastructure



S.3.6 Potential Expansion Sites and Associated Infrastructure

Bayou Choctaw, LA

The Bayou Choctaw SPR storage site occupies a 356-acre (144-hectare) site in Iberville Parish, LA, about 12 miles (19 kilometers) southwest of Baton Rouge. The Mississippi River is located about 4 miles (6.4 kilometers) east of the salt dome and the ICW, is about 0.5 miles (0.8 kilometers) to the west. The general area is swampy with an elevation ranging from less than 5 feet (1.5 meters) to more than 10 feet (3 meters) above mean sea level. Figure S.3.6.1-1 shows the location of Bayou Choctaw.

Big Hill, TX

Big Hill is located in Jefferson County, TX, 17 miles (27 kilometers) southwest of Port Arthur and 70 miles (113 kilometers) east of Houston. The existing site occupies approximately 250 acres (101 hectares). The surrounding area is predominantly rural with agricultural production as the primary land use. Figure S.3.6.2-1 shows the location of Big Hill.

West Hackberry, LA

West Hackberry occupies a 565-acre (229-hectare) site in Cameron and Calcasieu Parishes in southwestern Louisiana. The site is located approximately 20 miles (32 kilometers) southwest of the city of Lake Charles and 16 miles (26 kilometers) north of the Gulf of Mexico, which are beyond the extent of figure S.3.6.3-1. Figure S.3.6.3-1 shows the location of West Hackberry.

S.3.7 No-Action Alternative

Under the no-action alternative, the SPR would not be expanded, and it would continue to operate with a 727-MMB capacity. No expansion sites or new sites would be constructed, and DOE would violate the requirements of EPACT.

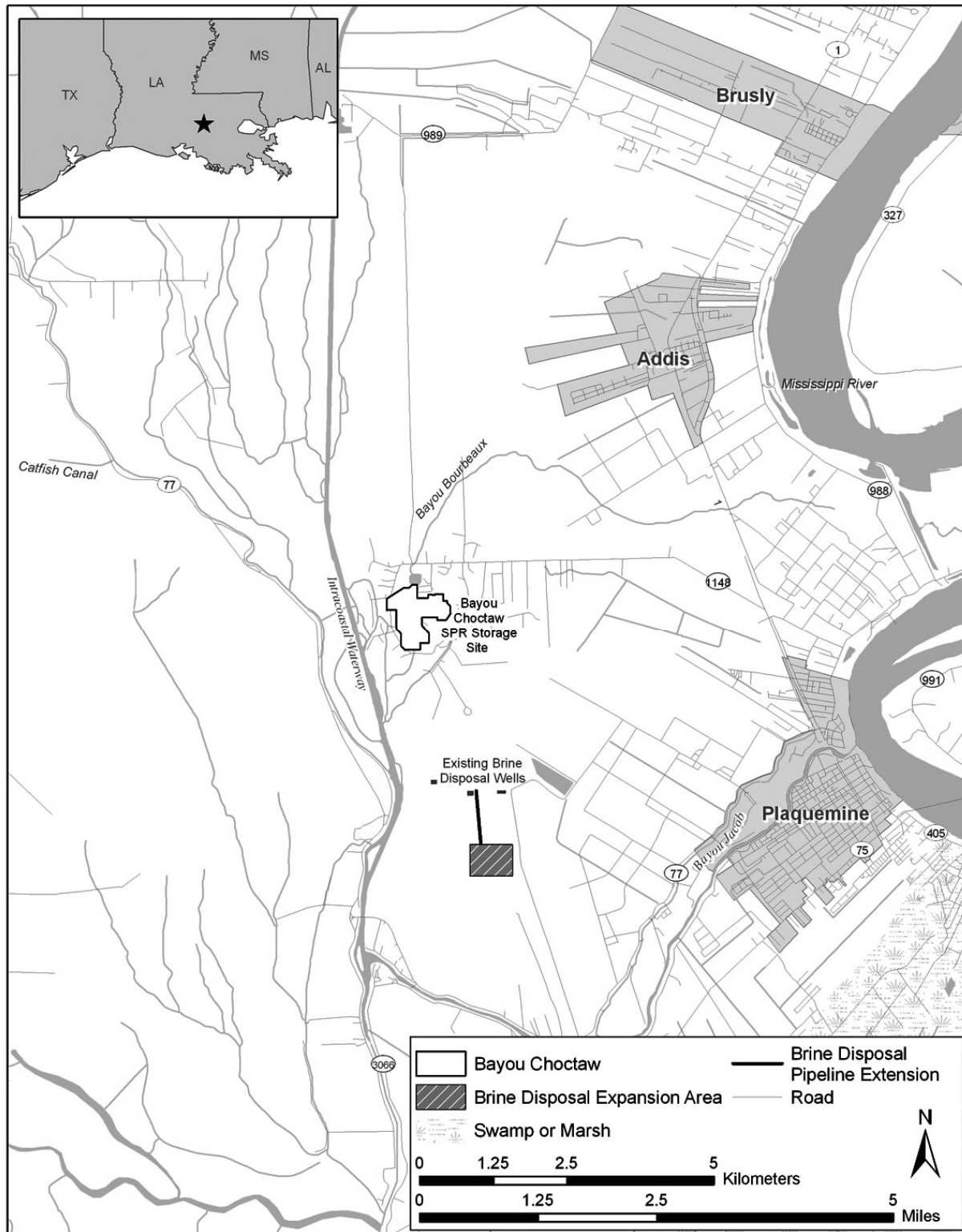
S.4 ALTERNATIVES ELIMINATED FROM DETAILED STUDY

As required by EPACT Section 303, DOE limited its review of potential new SPR sites and expansion sites to (1) sites that DOE addressed in the 1992 draft EIS and (2) sites proposed by a state where DOE had previously studied a site. DOE eliminated from consideration the alternative locations in Louisiana, Texas, New Mexico, and Virginia identified during public scoping because the sites were not technically feasible and would violate the mandate of EPACT Section 303.

DOE eliminated the alternative of expanding capacity at Bryan Mound, TX, an existing SPR site, because the salt dome has no available capacity for additional storage. While the 1992 draft EIS addressed the potential new salt dome sites at Cote Blanche, LA, and Weeks Island, LA, DOE's preliminary review of these sites for this draft EIS concluded that they are no longer viable due to the sale of the DOE's Weeks Island crude oil pipeline and its subsequent conversion to natural gas transmission.

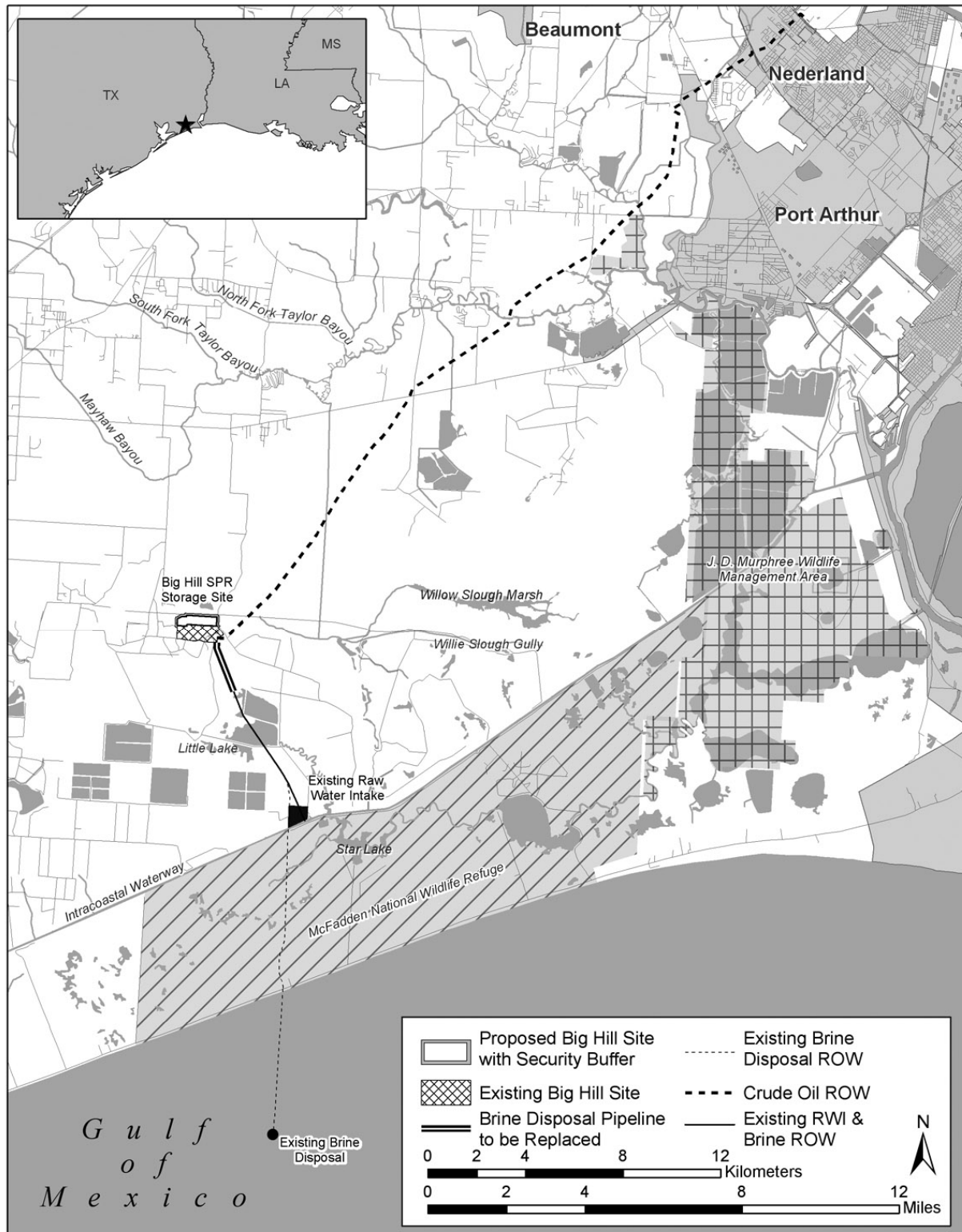
In addition, DOE considered several alternative pipeline alignments for most storage sites to minimize impacts to wetlands. Other alternative pipeline alignments that DOE eliminated from detailed consideration because they would affect more wetlands are described in Appendix B Floodplains and Wetlands Assessment. DOE also considered, but dismissed from detailed analysis, the alternative of using water from the ICW for the Richton storage site because of the significant length of new pipeline (over 100 miles [161 kilometers]) that would be required.

Figure S.3.6.1-1: Location of Bayou Choctaw Expansion Site and Proposed New Facilities



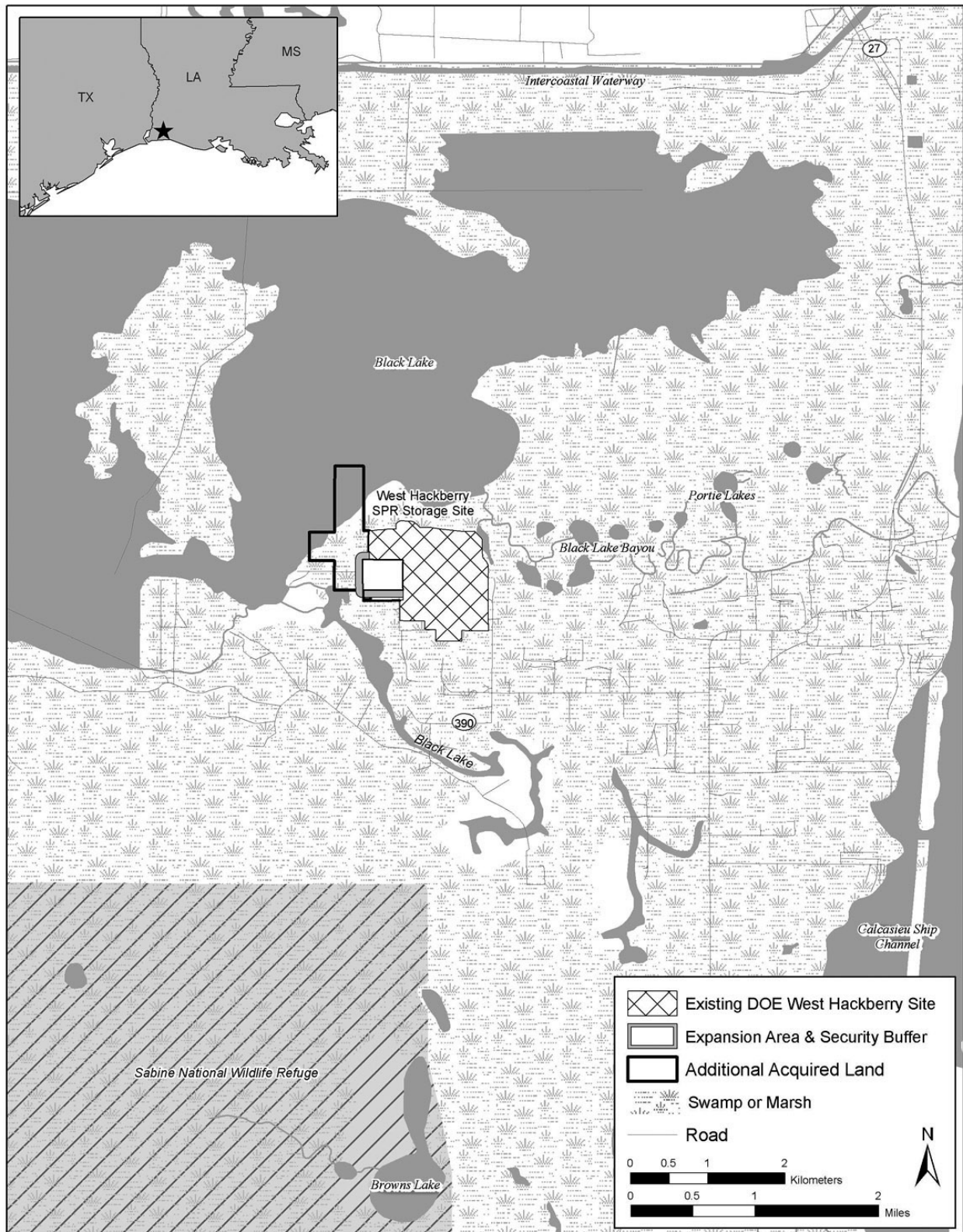
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Figure S.3.6.2-1: Location of Big Hill SPR Expansion Site and Proposed Infrastructure



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Figure S.3.6.3-1: Location of West Hackberry Expansion Site



S.5 SCOPING AND PUBLIC INVOLVEMENT

DOE received 67 scoping comments from 48 members of the public, companies, organizations, and government agencies. Comments focused mainly, but not exclusively, on the impacts of the construction and operation of the SPR facilities on water, land, and marine resources, and on various habitats of land and marine species. The following paragraphs summarize the major issues addressed in the comments. Unless otherwise noted, the discussions and analyses included in the draft EIS address the core topics of these comments. Copies of the comments received during the scoping period and complete public meeting transcripts are available from the Internet site <http://www.fossil.energy.gov/programs/reserves/spr/expansion-eis.html>.

Public Health and Safety, Accidental Releases: Commenters stated that DOE needs to address public health issues and the potential impacts on health and safety. One concern was the cumulative and secondary impacts the project presents for the increased risks of terrorism or accidents because of proposals to build liquid natural gas facilities near the proposed Stratton Ridge site. There is no longer a proposal to build such a facility near the Stratton Ridge site. The affected environment and analysis of potential environmental risks and public and occupational safety and health impacts are discussed in chapter 3, section 3.2.

Land Use: Commenters asked that DOE examine various potential impacts including loss of prime farmland, adverse effects on coastal areas, and land use changes at storage sites, pipelines rights-of-way, and other facilities. Commenters expressed concern that the proposed locations of the caverns for the Richton and Stratton Ridge sites would preclude other uses of the salt domes or affect mineral rights and expressed concern that the proposed Stratton Ridge site is located in the vicinity of security areas of existing and proposed industrial facilities. Affected land uses and site-specific analysis of potential land use impacts associated with the SPR sites are discussed in chapter 3, section 3.3. One commenter suggested that the EIS address impacts on the Gulf Islands National Seashore; however, the proposed action would not affect the Seashore.

Geology: Commenters expressed concerns about cavern creep and subsidence that might be caused by the creation of additional oil storage caverns at the already extensively developed Stratton Ridge salt dome, and suggested that the EIS evaluate this potential for adverse impacts. The affected environment and site-specific analysis of potential geology and soils impacts for each SPR site are discussed in chapter 3, section 3.4.

Air Quality: Noting that the Bayou Choctaw, Big Hill, and Stratton Ridge sites are in air quality nonattainment areas for the 8-hour ozone ambient standard and that they are subject to the Clean Air Act General Conformity rule and related state regulations, commenters asked that DOE estimate the potential emissions of volatile organic compounds and oxides of nitrogen during construction and operation at these sites and compare them to conformity threshold levels. Conformity analyses for the Bayou Choctaw, Big Hill, and Stratton Ridge sites are discussed in chapter 3, section 3.5. Other issues raised by commenters included cumulative air pollutant emissions and emissions from the oil blanket during solution mining. The affected environment and analysis of potential air quality impacts of construction and operation of the proposed action are discussed in chapter 3, section 3.5 and chapter 4.

Water Resources: Commenters requested that DOE evaluate the potential impacts of construction and operation of new oil storage caverns and underground injection wells on local aquifers, and the secondary and cumulative impacts of SPR expansion on wetlands and water quality, including water salinity. Commenters expressed concern about potential impacts to rivers and coastal areas. Commenters also requested analyses of potential impacts of water withdrawal from freshwater bodies for SPR expansion and operation, runoff from construction and operation of SPR facilities, and brine disposal in the Gulf of

Mexico. Commenters suggested alternative sources of raw water intake for the Stratton Ridge and Richton sites. The affected environment and analysis of potential impacts to water resources from construction and operation of the proposed action are discussed in chapter 3, section 3.6 and chapter 4.

Biological Resources: Commenters asked that the EIS analyze the potential primary, secondary, and cumulative impacts of SPR expansion on a variety of habitats and species. Habitats of particular concern included wetlands and essential fish habitat (EFH). Fauna of concern included shrimp, oysters, and native fish species including those that are commercially important; migratory marine species including sharks and billfishes; water birds; migratory birds; and some threatened and endangered species such as the Bald Eagle, Diamondback Terrapin, Gulf Sturgeon, Red-bellied Turtle, Brown Pelican, and Louisiana Black Bear, and also candidate species. Commenters identified specific biological resource areas (e.g., forested wetlands, wildlife refuges, national seashores, national forests, and live bottoms crossed by offshore brine disposal pipelines) or specific flora or fauna species (e.g., specific locations of Bald Eagle nesting areas) near specific SPR sites, pipeline ROWs, raw water withdrawal areas, and brine disposal areas.

The affected environment and potential impacts to biological resources from construction and operation of the proposed action are discussed in chapter 3, section 3.7. The impact assessment methodology for plants, wetlands, and wildlife is described in section 3.7.1.1; for special status species (including threatened and endangered species, marine mammals, and managed fisheries) in section 3.7.1.2; for EFH in section 3.7.1.3; and for special status areas (including national wildlife refuges, wilderness areas, Coastal Wetlands Planning, Protection and Restoration Act areas, and coastal natural resource areas) in section 3.7.1.4. Potential impacts associated with specific areas of concern and specific species of concern identified by commenters are addressed in the site-specific impact analyses in chapter 3, section 3.7 and chapter 4.

Socioeconomics: Commenters requested that DOE evaluate potential economic impacts on local communities, commercial and recreational fishing interests, tourism, and other economic interests in Louisiana, Mississippi, and Texas, particularly in areas affected by Hurricane Katrina. Similarly, commenters expressed concern about impacts to local industries by competition for workers and housing already in short supply. The affected environment and analysis of potential socioeconomic impacts of construction and operation of the proposed action are discussed in chapter 3, section 3.8.

Cultural Resources: Commenters addressed potential Native American concerns, particularly for the Richton and Bruinsburg sites. Commenters also identified themselves as having cultural affiliation with specific SPR sites, and requested that they be notified and that specific procedures be followed in the event that cultural artifacts are discovered during SPR site development. They also suggested the need for archaeological and cultural surveys at the Stratton Ridge, Richton, and Big Hill sites should these sites be selected by DOE. The site-specific cultural resources affected environment and potential impacts to cultural resources for each SPR site are discussed in chapter 3, section 3.9. Specific procedures that would be implemented by DOE for the selected sites are also discussed in section 3.9.

Environmental Justice: A commenter requested that DOE fully consider the environmental justice impacts of additional environmental risk and pollution associated with SPR expansion in low-income communities in light of the effects of Hurricane Katrina. Commenters also identified specific aspects (e.g., income level) of their communities. The affected environment and site-specific environmental justice impact analyses for each SPR site are presented in chapter 3, section 3.11.

Alternatives: Commenters proposed alternative locations for storage of crude oil. The suggestions included sites in Louisiana, Texas, New Mexico, and Virginia. A discussion of the proposed action and alternatives, including the statutory basis for selection of alternatives and alternatives considered but eliminated from detailed study, is included in sections S.3 and S.4 and chapter 2, section 2.7.

Irreversible and Irretrievable Commitment of Resources: A commenter expressed concern that development of SPR storage caverns would result in the irretrievable loss of salt resources that could otherwise be used for chlorine production. This issue is analyzed in chapter 3, section 3.3 and chapter 5.

Cumulative Impacts: Commenters requested that secondary and cumulative impacts of the proposed action and similar past, ongoing, or future actions, including cumulative impacts to water quality, biological resources, air quality, and socioeconomics, be addressed. Commenters identified specific actions (e.g., proposed liquefied natural gas facilities, future oil and gas production and pipelines) and requested that impacts of these actions be considered in the cumulative impacts analysis. Commenters also identified specific impacts (e.g., fish mortality caused by Hurricane Katrina) and requested that such impacts be considered in the cumulative impact analysis. Commenters suggested that the cumulative impacts analysis address specific activities (e.g., commercial fishing). Relevant actions and analysis of potential cumulative impacts of the proposed action are discussed in chapter 4.

Mitigation: Commenters requested that measures to avoid, minimize, and offset impacts (e.g., impacts to wetlands) of construction and operation of the proposed action be discussed in a mitigation section of the EIS. Commenters suggested specific mitigation measures be applied to specific SPR sites, pipeline ROWs, RWI areas, or brine disposal areas. The potential impacts and the associated mitigation measures are discussed in the same sections of the EIS (e.g., mitigation measures for impacts to wetlands are discussed in section 3.7 and appendix B).

S.6 ENVIRONMENTAL CONSEQUENCES

This section discusses the potential environmental impacts of the proposed action across 10 resource areas. The areas of greatest potential impact are land use, water resources, biological resources, and cultural resources, as shown in table S.6-1.

- **Land Use.** The proposed action would create potential land use conflicts where two ROWs pass through a national wildlife refuge for the Stratton Ridge site.
- **Water Resources.** The Richton alternative would use the Leaf River as a raw water source, which has a highly variable flow. The proposed action may have a potential adverse effect because the proposed withdrawal could deplete the flow below the minimum instream flow established by the Mississippi Department of Environmental Quality for low flow periods.
- **Biological Resources.** The primary biological resources that would be affected by the proposed action include wetlands and species protected under the Federal Endangered Species Act or related state requirements. All alternatives would affect a variety of wetlands. The adverse effects would be mitigated by the wetland compensation requirements of the Section 404/401 permit under the Clean Water Act. All alternatives, with the exception of Clovelly, may affect at least one Federally listed endangered or threatened species.
- **Cultural Resources.** SPR development at the Bruinsburg site could result in potential adverse effects on the historic setting of the Civil War landing of the Union Army in Mississippi and an associated route of troop movements in an area that could become eligible for the National Register of Historic Places as a core study area.

The following text summarizes the potential impacts by resource area in the order listed in table S.6-1. In addition, tables S.6.11-1 and S.6.11-2 at the end of this section compare the potential impacts and possible mitigation measures by alternative.

Table S.6-1: Potential Resource Impacts by Alternative

| Alternative | Environmental Risks, Health, & Safety | Land Use | Geology and Soils | Air Quality | Water Resources | Biological Resources | Socioeconomics | Cultural Resources | Noise | Environmental Justice |
|---------------------------------------|---------------------------------------|----------|-------------------|-------------|-----------------|----------------------|----------------|--------------------|-------|-----------------------|
| 1 – Bruinsburg | - | - | - | - | - | ● | - | ● | - | - |
| 2 – Chacahoula | - | - | - | - | - | ● | - | - | - | - |
| 3 – Clovelly | - | - | - | - | - | - | - | - | - | - |
| 4 – Clovelly 80 MMB/Bruinsburg 80 MMB | - | - | - | - | - | ● | - | ● | - | - |
| 5 – Clovelly 90 MMB/Bruinsburg 80 MMB | - | - | - | - | - | ● | - | ● | - | - |
| 6 – Richton | - | - | - | - | ● | ● | - | - | - | - |
| 7 – Stratton Ridge | - | ● | - | - | - | ● | - | - | - | - |
| 8 – No-Action | - | - | - | - | - | - | - | - | - | - |

● = Greatest potential resource impacts

S.6.1 Environmental Risks and Public and Occupational Safety and Health

For this analysis, DOE considered risk as both the likelihood (or chance) of occurrence and the potential consequences. While accidental releases can occur during long-term storage, the risk of an oil spill generally is dominated by transfer activities. Furthermore, the maximum quantity filled occurs with the initial fill. This initial-fill activity also represents the greatest incremental chance of spills associated with current imports into the United States because subsequent drawdowns and refills would just replace a transfer of oil from interrupted imports. Therefore, this analysis focuses on the likelihood of an oil spill during initial-fill activities.

The risks from oil spills would be similar across alternatives because the risks are primarily a function of the amount of oil transferred into SPR caverns, which would be similar across alternatives. The predicted number of oil spills would be approximately 16 spills during initial site fill. Based on historical spill statistics, the predicted oil spills would likely be low volume (less than 100 barrels).

The potential consequences of such infrequent, low-volume, accidental releases of oil would be minor. The releases generally would result in localized soil contamination at the storage sites and terminal locations, which would be contained and cleaned up. Elevated concentrations of oil constituents occurring in the water column and on the water surface immediately after a spill would decrease over time because of dispersion, dilution, and degradation. The rate of concentration decline would depend on the size and flushing rate of the water body affected, as discussed below. Although there is a low probability of an accidental brine discharge, the consequences of a release could be significant if the release was large and/or it migrated into a sensitive aquatic system or plant community. A large release of oil could result in mortality for plants and animals through chemical toxicity, physical smothering, respiratory interference, food and habitat loss, and inhalation or ingestion. Impacted communities can take decades to recover from a large release. A release of brine could cause significant and sometimes fatal physiological trauma to plants and animals, especially bird eggs, fish eggs, and fish larvae. While the spills would result in some air contaminants, the contaminants would be released so infrequently and in such small quantities that they would be readily dispersed in the atmosphere and would have little effect on ambient air quality along site boundaries.

The brine spill risk also would be low. The risks would be similar across alternatives because the risks are primarily a function of the amount of brine disposed of, which would be similar across alternatives. The total number of brine spills predicted would be 96 to 103 for each alternative. Based on historical data, however, these spills would mostly be of low volume (less than 50 barrels). Higher-volume brine spills, while possible, are very unlikely based on SPR experience. Unless the spills were large or sustained, neither of which is predicted, the brine contaminants would be diluted and dispersed into the surrounding area and waterbodies by rain; soils and vegetation affected by changes in the mineral concentrations would quickly recover; and any impacts of changes in mineral concentrations on shallow groundwater and air quality would be small. While unlikely, a large discharge of brine into a sensitive aquatic system or plant community could have significant effects as discussed above.

The risk of chemical spills and fire would be small and similar across alternatives given the identical activities for each alternative, excluding the no-action alternative. The occupational injuries also would be small and similar across alternatives. For example, the rate of lost workdays due to injuries at new and expanded sites would be similar to the rate at existing SPR sites, which is 0.83 workdays per 200,000 worker hours. This rate is much lower than the Bureau of Labor Standards average of 5.3 workdays per 200,000 worker hours.

S.6.2 Land Use

The analysis of land use addresses land-use conflicts, visual resources, prime farmland, and coastal zone management. Each of these four topics is addressed below.

Possible Land Use Conflicts

The regulations for implementing the National Environmental Policy Act require agencies to discuss possible conflicts between the proposed action and the objectives of Federal, state, and local land use plans, policies, and controls (40 CFR 1502.16(c)). Each of the proposed alternatives would require the commitment of land for the development and operation of new and expansion sites and their infrastructure. The total area would range from a high of 4,494 acres (1,820 hectares) for the Richton alternative with three expansion sites to a low of 693 acres (281 hectares) for Clovelly. Tables S.6.11-1 and S.6.11-2 identify the area required for the other alternatives.

The proposed new storage sites and their infrastructure generally would be located in rural areas where they would not conflict with surrounding land uses. At Clovelly and the expansion sites, the new facilities would be similar to existing facilities and therefore land use would not change substantially. No substantial land-use conflicts would arise for the Chacahoula and Clovelly alternatives. For the other alternatives, the following conflicts would arise for their infrastructure development:

- For the Bruinsburg 160 MMB alternative, the crude oil pipeline to Peetsville, MS, would cross the Natchez Trace National Scenic Trail and the Natchez Trace Parkway along an existing power line ROW. (All proposed pipelines would be underground except where they cross levees.) The expansion of the ROW would require clearing vegetation and would slightly expand the existing land use of the ROW. The same pipeline would travel through private property contained within the proclamation boundary of the Homochitto National Forest for 6.8 miles (11 kilometers). (The proclamation boundary defines an area where the Forest Service may purchase land from willing sellers to expand the forest without further Congressional authorization.) About 5.6 miles (9 kilometers) would parallel an existing highway in a new corridor. While this would be a new land use, other land uses in the new ROW are unlikely to be substantively affected. The remainder of the pipeline through the proclamation area would be in an existing ROW.

- For the Clovelly 80 or 90 MMB/Bruinsburg 80 MMB alternatives, the crude oil pipeline to Jackson, MS, would cross the Natchez Trace National Scenic Trail and Natchez Trace Parkway along an existing power line ROW, as discussed above. No pipeline for this site would cross the Homochitto National Forest proclamation area for these alternatives.
- For the Richton alternative, the pipeline to Liberty, MS, would cross the Percy Quin State Park for about 0.5 miles (0.7 kilometers) in a new ROW. If this alternative is selected, DOE would work with the State of Mississippi to re-align the pipeline to cross the park in an existing ROW where feasible.
- For the Stratton Ridge alternative, approximately 3 miles (4.8 kilometers) of the RWI pipeline, brine disposal pipelines, and two power lines would cross the Brazoria National Wildlife Refuge and a privately owned land in the refuge's proclamation area in the same new ROW. In addition, 4.7 miles (7.6 kilometers) of the crude oil pipeline would cross the refuge in an existing pipeline ROW. If this alternative is selected, DOE would work with the U.S. Fish and Wildlife Service (USFWS) to reduce these land use conflicts, such as by placing the power line underground.

Visual Resources

Construction activities at new SPR storage sites would result in temporary visual impacts and long-term changes in the existing landscape. These new facilities would appear industrial in nature and would conflict with surrounding natural vegetation. The impacts, however, would be minor because the new facilities would not be visible from residential or commercial areas and the sites would have limited public access. Expansion of the existing SPR facilities would not provide a large visual contrast with the existing landscape because of the existing industrial land use at these sites.

The construction of pipelines, power lines, and other infrastructure would have only minor visual impacts, with three exceptions:

- The development of the Bruinsburg 160 MMB or 80 MMB site would have a visual impact on the historic Civil War landscape, as noted below in section S.6.8.
- As discussed under land use conflicts above, the ROWs for several alternatives would cross a national parkway, national scenic trail, national forest proclamation area, state forest, or national wildlife refuge. These ROWs would affect the views in these corridors. DOE would attempt to preserve the natural landscapes in these settings by using existing ROWs where feasible, placing pipelines underground, and otherwise working with other agencies to minimize the impacts.
- For the Stratton Ridge alternative, the RWI would be located along the shoreline of the ICW across from the border of the Brazoria National Wildlife Refuge. Recreational sightseers visiting the refuge might be sensitive to change in the visual quality, even though the RWI would be outside the refuge.

Farmland

SPR development activities would cause farmland conversion by shifting the use of land to nonfarm uses. Any prime or unique farmlands located on proposed SPR storage sites, RWI facilities, and oil distribution terminals would be permanently converted to nonfarm uses because the potential use of that land for agricultural purposes would be lost. The construction of pipelines and power lines would temporarily prohibit agricultural use of farmland within the construction easement during the construction period of up to six to ten weeks at any specific location.

To assess these potential impacts, DOE, in consultation with the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), scored all of the individual sites and all of the alternatives using the farmland conversion impact rating. This scoring system is specified in the Farmland Protection Policy Act regulations (7 CFR Part 658). It considers a wide variety of factors related to potential farmland conversion impacts, including the amount of prime or unique farmland that would be converted; the amount of statewide and locally important farmland; the use of the land and nearby land; the distance to urban built-up areas and urban support services; on-farm investments; and compatibility with existing agricultural use. Under the regulations, "sites receiving a total score of less than 160 need not be given further consideration for protection and no additional sites need to be evaluated" (40 CFR 658.4(c)(2)). While all alternatives would affect farmlands, each alternative had a score below 160 out of 260 possible points and therefore needs not be given further consideration for protection.¹

Coastal Zone Management

The Bruinsburg, Chacahoula, Richton, and Bayou Choctaw sites are outside the coastal zone, but some of their associated infrastructure, as well as the expansion site and infrastructure of Big Hill and the expansion site of West Hackberry would be in coastal zones. The Clovelly and Stratton Ridge sites also are in the coastal zone. The Clovelly 80 MMB/Bruinsburg 80 MMB alternative and the Clovelly 90 MMB/Bruinsburg 80 MMB alternative would have the same components in the coastal zone as the individual Clovelly and Bruinsburg alternatives. DOE consulted with the coastal zone management agencies for all three states regarding compliance with the Federal Coastal Zone Management Act. The agencies preferred that DOE coordinate its consistency determination for the selected alternative through the U.S. Army Corps of Engineers (USACE) during the Section 404 wetlands permitting process. USACE would then forward the determination to the coastal zone management agencies, which would conduct a consistency review and either object or concur with DOE's determination. This process satisfies the requirements of the Federal Coastal Zone Management Act.

S.6.3 Geology and Soils

Local subsidence, limited to the area above the proposed storage caverns, would range from about 2 to 6 feet (0.7 to 2 meters) over 30 years for any of the alternatives. These depressions on dry land might cause minor ponding in the area overlying the caverns. Depressions in wetland areas would increase the zone of saturation closer to the surface or the depth of any standing water. The new caverns would be designed to not jeopardize the structure or integrity of existing caverns on the salt domes.

S.6.4 Air Quality

The proposed action would generate low emissions of criteria pollutants. Emissions levels would be below levels of concern, including below conformity determination thresholds in the ozone nonattainment areas at Bayou Choctaw, Big Hill, and Stratton Ridge. At the Stratton Ridge site, the conformity review conducted for this draft EIS estimates that the maximum emissions of volatile organic compounds would be slightly below the threshold that triggers a full conformity determination. Thus, if the Stratton Ridge site were selected, DOE would conduct an additional conformity review using the final site design to determine if the current estimate is sufficiently conservative and would not be exceeded.

¹ The location of some of the proposed sites and their infrastructure changed slightly since DOE consulted with NRCS. Additional consultations to incorporate the new information were not feasible for inclusion in this draft EIS. Nonetheless, the nature of these minor changes would not increase the score for any site and its infrastructure to be greater than 160 points.

The greatest source of greenhouse gas emissions for SPR expansion are carbon dioxide associated with construction equipment and motor vehicles and methane from cavern leaching. During construction, the maximum annual average greenhouse gas emissions associated with any alternative would be 0.22 million tons of carbon dioxide equivalents. The emissions during SPR operations would be smaller, about one-third as much as during construction.

S.6.5 Water Resources

Surface Water

The proposed facilities would withdraw water from nearby surface water bodies for use in cavern solution mining. Two of the proposed new sites (Chacahoula and Stratton Ridge) and two expansion sites (Big Hill and West Hackberry) would withdraw water from the ICW. The proposed new Bruinsburg site would withdraw water from the Mississippi River. Two new sites (Clovelly and Richton) and one expansion site (Bayou Choctaw) would withdraw water from local surface water bodies other than the ICW. With the exception of the Richton alternative, the water withdrawal would represent a small amount of the average available water from river flows or water bodies for all alternatives except the Richton alternative because the rivers and water bodies are large. For the new Richton site, the flow rate of the Leaf River is highly variable and there would be a potential for withdrawing a significant fraction of the total river flow during drought periods. This withdrawal could exceed the minimum in-stream flow levels established by the Mississippi Department of Environmental Quality during periods of low flow in the Leaf River.

Brine from the solution mining of the salt caverns or from filling caverns with oil would be discharged into the Gulf of Mexico from the proposed SPR facilities, with the exception of Bruinsburg, Bayou Choctaw, and West Hackberry, where brine would be injected into deep subsurface aquifers via injection wells. All of the proposed brine diffuser locations in the Gulf of Mexico would be in waters of similar depths along the coastline (i.e., 30 feet [9 meters]), with placement at a depth that does not affect navigation. Small increases in salinity levels (modeling indicated a maximum of 4.7 parts per thousand for all alternatives with brine discharge into the Gulf of Mexico) would occur from the discharge, but the increase would be within natural salinity variation. However, brine discharged through the proposed Chacahoula diffuser may tend to pool at the sea bottom due to flow restrictions. The bottom of the Gulf of Mexico slopes gently seaward at all of the proposed diffuser locations except for Chacahoula, which is located in close proximity to a shoal area (Ship Shoal). Brine plume movement at Chacahoula would be restricted due to the bathymetry resulting from the presence of the shoal area.

All alternatives would involve the construction of multiple pipelines that would cross a variety of surface water bodies. The construction activities would cause temporary and minor erosion and sedimentation. Only the Bruinsburg, Richton, and Stratton Ridge pipelines would cross areas with state programs (e.g., wellhead protection areas) to protect against contamination of particular drinking water (surface or groundwater) sources. Even though the Bruinsburg, Richton, and Stratton Ridge alternatives involve pipelines that would pass through protected drinking water areas, no alternative would be likely to contaminate a drinking water source.

The effects of a brine or oil discharge into surface water were discussed above under Environmental Risks and Public and Occupational Safety and Health.

Groundwater

As previously mentioned, brine from Bruinsburg, Bayou Choctaw, and West Hackberry would be injected into deep saline aquifers via injection wells. West Hackberry would use an existing injection system;

Bayou Choctaw would use existing and proposed new injection wells; and at Bruinsburg, DOE would construct new injection wells.

The potential for brine to leak into shallow water source aquifers is very low for all sites. Brine injection wells would be sealed and pressure tested to assure that leakage would not occur. DOE also would implement a shallow groundwater-monitoring program at each site to ensure protection of groundwater quality. Additionally, each site has confined aquifers that are separated by impermeable strata, so impacts to groundwater associated with the disposal of brine by deep well injection would be minimal. At Bayou Choctaw, the proposed receiving formation for injection of brine is below any aquifers containing fresh or slightly saline water. The West Hackberry expansion would use the existing SPR brine disposal facilities, which DOE has previously assessed and determined would not result in adverse impacts to groundwater. Based on well logs at Bruinsburg, DOE is uncertain whether the Sparta formation alone would have adequate capacity to handle the proposed brine injection volumes and rates; therefore, if this alternative is selected, DOE would consider developing injection wells in two formations. Brine injected into these aquifers at Bruinsburg would travel further downgradient into increasingly saline portions of the aquifers, and away from the portions of the aquifers that constitute current or potential sources of fresh water.

Floodplains

A substantial portion of the proposed storage sites and associated infrastructure of each alternative would be located in the 100-year and 500-year floodplain. Between 56 acres (23 hectares) under the Clovelly alternative and 276 acres (112 hectares) under the Bruinsburg alternative of the 100-year floodplain would be permanently affected. Between 27 acres (11 hectares) under the Chacahoula, Clovelly, and Richton alternatives and 216 acres (87 hectares) under the Stratton Ridge alternative of the 500-year floodplain would be permanently affected. The amount of onsite construction would vary by site, with the greatest amount of floodplain disturbance at Stratton Ridge and Bruinsburg. Offsite pipeline construction would affect floodplains only during construction, and areas would be brought back to grade following construction. Pipeline construction associated with the Chacahoula project crosses the largest area of floodplains.

Because most of the infrastructure on the affected floodplains would be built below ground, the impacts would be lessened. The main impacts on flood storage and flooding attenuation would result from constructing some aboveground structures and placing fill at the new cavern facilities at Chacahoula, Bayou Choctaw, Stratton Ridge, and Big Hill. These fill areas, however, would be insignificant in comparison the total areas of the floodplains where they are located. The Chacahoula, Richton, Stratton Ridge, and Big Hill sites are located in floodplains that extend over hundreds of acres in coastal basins. The Bruinsburg and Bayou Choctaw sites also are located in an extensive floodplain area associated with the Mississippi River. Thus, fill areas developed as part of the proposed action at these sites would have insignificant impact on the flood storage capacity or hydraulic function of the related floodplains.

DOE would comply fully with applicable local and state guidelines, regulations, and permit requirements regarding floodplain construction. In general, DOE would be required to evaluate the impact of placing fill or structures in the 100-year floodplain and 500-year floodplain and to demonstrate that the proposed fill/structures would not increase the base flood elevation.

Based on the factors discussed above and in detail in sections 3.6 and in appendix B, DOE expects that overall impacts to floodplain hydraulic function, and to lives and property, would not be significant.

S.6.6 Biological Resources

Plants, Wetlands, and Wildlife

Each alternative would result in the clearing, grading and filling of a variety of upland and wetland communities. For each alternative, the ROWs would result in temporary impacts on wetlands within the construction easement and permanent impacts within the permanent ROW from converting forested and scrub-shrub wetland communities to emergent wetlands. For all filling and permanent conversion of wetlands, DOE would complete a wetland delineation, secure a jurisdictional determination, and secure Clean Water Act Section 404/401 permits from the U.S. Army Corps of Engineers (USACE) for all impacts to jurisdictional wetlands. DOE would prepare a wetland compensation plan to mitigate the impacts to jurisdictional wetlands, as described in appendix B, section B.4.

Table S.6.6-1 summarizes the wetland impacts by alternative. As presented in table S.6.6-1, fill includes the dredging or filling of a wetland; conversion is the conversion of one wetland type to another type (e.g., forest wetlands to emergent wetlands), and temporary disturbance includes short-term construction activities in wetlands.

Table S.6.6-1: Impacts on Wetlands

| Alternative | Storage and Expansion Sites and Ancillary Facilities | | All ROWs | |
|---------------------------------------|--|-------------------------------|-----------------------------|-----------------------------|
| | Filled Wetlands Acres | Permanent Conversion Acres | Temporary Easement Acres | Permanent Easement Acres |
| Bruinsburg | 150 | 25 | 306 | 211 |
| Chacahoula | 175 | 220 | 1,222 | 867 |
| Clovelly | 49 | 7 | 122 | 60 |
| Clovelly 80 MMB/ Bruinsburg 80 MMB | 86 | 23 | 398 | 253 |
| Clovelly 90 MMB/ Bruinsburg 80 MMB | 86 | 23 | 398 | 251 |
| Richton | 90 | 9 | 907 | 527 |
| Stratton Ridge | 277 | 80 | 288 | 181 |

1 acre = 0.405 hectares

The Clovelly alternative would affect the fewest acres of wetlands because the new site would be developed at an existing crude oil storage and distribution facility and no new off-site infrastructure or pipelines would be required. The relative impacts on wetlands (fill, conversion, and temporary disturbance) associated with the Clovelly 80/Bruinsburg 80 MMB, Clovelly 90/Bruinsburg 80 MMB, and Bruinsburg 160 MMB alternatives would be approximately the same compared to each other. Up to 39 acres of relatively rare and ecologically important bald cypress forested wetlands would be filled or converted at Bruinsburg under the Clovelly 80 MMB/Bruinsburg 80 MMB, the Clovelly 90 MMB/Bruinsburg alternatives, and up to 103 acres under the Bruinsburg alternative. The impacts on wetlands under the Stratton Ridge alternative would involve filling and converting up to 258 acres of relatively rare and ecologically important bottomland hardwood forest at the Stratton Ridge site.

The Richton alternative would result in almost double the amount of wetland impacts from fill, conversion, and temporary disturbance (over 1,500 acres [619 hectares]) than the Bruinsburg alternative. The majority of the wetland impacts associated with the Richton alternative would result from the long

ROWs, over 200 miles, and the associated impacts from the clearing within the ROW. The Chacahoula alternative would have the most acres of wetlands affected by fill, conversion, and temporary disturbance (over 2,400 acres [970 hectares]). Up to 339 acres (137 hectares) of relatively rare and ecologically important bald cypress forested wetlands would be filled or converted at Chacahoula, and the majority of each ROW would pass through the extensive wetlands located throughout southern Louisiana. Appendix B presents a detailed discussion of the wetlands associated with each site and alternative.

The effects of a brine or oil discharge into surface water was discussed above under Environmental Risks and Public and Occupational Safety and Health.

Threatened and Endangered Species

With the exception of the Clovelly alternative, where no Federally listed threatened, endangered, or candidate species would be affected, each alternative may affect one or more Federally listed species. Two aquatic species may be affected under the Bruinsburg alternative; two terrestrial species may be affected under the Chacahoula alternative; and a single aquatic species may be affected under both the Clovelly 80 MMB/Bruinsburg 80 MMB alternative and the Clovelly 90 MMB/Bruinsburg 80 MMB alternative. Two terrestrial and three aquatic species may be affected under the Richton alternative, and a single terrestrial species may be affected under the Stratton Ridge alternative. The following summarizes the impacts by alternative:

Bruinsburg

- Fat Pocketbook Mussel, Federally endangered, may be affected by the Bruinsburg ROW in-stream construction in Coles and Fairchild creek.
- Pallid Sturgeon, Federally endangered, may be affected by the in-river construction and operation of the Bruinsburg RWI structure.

Chacahoula

- Bald eagle, Federally threatened, may be affected by the development and operation of the Chacahoula site and construction along the Chacahoula ROWs. Potential foraging, roosting, and nesting habitat may be impacted.
- Brown Pelican, Federally endangered, may be affected by the construction along the Chacahoula ROW to LOOP. Roosting habitat may be affected.

Clovelly

- No Federally listed species would be affected.

Clovelly 80 MMB/Bruinsburg 80 MMB

- Pallid Sturgeon, Federally endangered, may be affected by the in-river construction and operation of the Bruinsburg RWI structure.

Clovelly 90 MMB/Bruinsburg 80 MMB

- Pallid Sturgeon, Federally endangered, may be affected by the in-river construction and operation of the Bruinsburg RWI structure.

Richton

- Gopher Tortoise, Federally threatened, may be affected by the construction along the Richton ROWs, which may result in a loss of habitat and individuals.
- Black Pine Snake, Federal candidate, may be affected by the construction along the Richton ROWs, which may result in a loss of habitat and individuals.
- Yellow Blotched Map Turtle, Federally endangered, may be affected by the in-water construction and operation of the Richton RWI structure. A loss of habitat, and impingement of and entrainment of early life stages or altering the hydrologic regime in the Leaf River may occur.
- Gulf Sturgeon, Federally endangered, may be affected by the in-water construction and operation of the Richton RWI structure. The RWI may adversely affect designated critical habitat and may adversely affect the population through impingement of and entrainment of early life stages or altering the hydrologic regime in the Leaf River.
- Pearl Darter, Federal candidate, may be affected by the in-water construction and operation of the Richton RWI structure. The RWI may result in a loss of habitat, impinge and entrain pearl daters in early life stages, or alter the hydrologic regime in the Leaf River.

Stratton Ridge

- Bald eagle, Federally threatened, may be affected by the development and operation of the Stratton Ridge site. Construction along the Stratton Ridge ROWs may affect potential foraging, roosting, and nesting habitat.

In accordance with Section 7 of the Endangered Species Act, DOE has consulted with the USFWS and has identified the Federally listed species that the proposed action would not affect and the Federally listed species that the proposed action may affect. Upon the selection of an alternative, DOE would continue consultations with USFWS in accordance with Section 7.

Special Status Area

The Chacahoula alternative would not affect special status areas. The Bruinsburg, Clovelly 80 MMB/ Bruinsburg 80 MMB, and Clovelly 90 MMB/Bruinsburg 80 MMB alternatives would involve a ROW crossing the Natchez Trace Parkway. In addition, the crude oil ROW to Peetsville under the Bruinsburg alternative would pass through the proclamation area of the Homochitto National Forest. The Clovelly alternative would be located adjacent to the Gulf ICW to Clovelly Hydrologic Restoration project, but would not affect the project. The Richton alternative would involve a ROW crossing the Percy Quin State Park. The Stratton Ridge alternative would involve two ROWs that would pass through the Brazoria National Wildlife Refuge. The impacts on the special status areas would include temporary and permanent changes in the vegetative communities along the construction and permanent ROWs, respectively.

For issues involving the Natchez Trace Parkway, the Homochitto National Forest, the Brazoria National Wildlife Refuge, and Percy Quin State Park, DOE would coordinate with the National Park Service, the U.S. Forest Service, the USFWS, and the State of Mississippi to minimize the impacts to important natural resources.

Essential Fish Habitat

The Chacahoula, Richton, and Stratton Ridge alternatives would require developing new offshore brine disposal systems. The Bruinsburg alternative would use brine injection wells; the Clovelly alternative would use LOOP's existing offshore brine diffusion system; and the Clovelly 80 MMB/Bruinsburg 80 MMB alternative and the Clovelly 90 MMB/Bruinsburg 80 MMB alternative would use a combination of new brine disposal wells at Bruinsburg and the existing offshore brine diffusion system at Clovelly. The underwater construction of an offshore brine pipeline and diffuser would pass through EFH and would temporarily increase suspended sediments and drive marine species from the area. The operation of new brine diffusers plus the existing brine diffusers associated with the Clovelly, Clovelly 80 MMB/Bruinsburg 80 MMB, and Clovelly 90 MMB/Bruinsburg 80 MMB alternatives, as well as the existing offshore diffuser at Big Hill would cause minor increases in the salinity concentrations. The estimated salinity concentrations would increase by up to 4.7 parts per thousand around the diffusers and would affect EFH. Some marine species may avoid the areas with increased salinity concentrations; however, the increase in the salinity concentration would be within the normal salinity concentration range of the Gulf of Mexico. Appendix C discusses the brine plume modeling that DOE completed and appendix E describes the impacts associated with offshore construction and brine diffusion, including brine pooling, on EFH.

S.6.7 Socioeconomics

The proposed action would require a peak construction work force of approximately 230 to 550 employees at the new storage site or combination of sites and infrastructure, plus another 250 to 350 employees for the expansion sites and their infrastructure. The operations workforce would be about 75 to 100 employees at each site and about 25 additional employees at each expansion site. This employment would create positive local economic benefits under all alternatives.

While the proposed storage sites and infrastructure generally are located in or near rural communities, they are close (e.g., 20 to 45 miles [32 to 72 kilometers]) to more populated urban areas. Most workers would come from these relatively close areas. In-migration to the areas near the storage sites would be small relative to the regional population. Thus, the proposed action would create no noticeable increase in competition for labor, traffic, or demand for housing and public infrastructure and services.

S.6.8 Cultural Resources

The proposed action would have the potential to damage or destroy archaeological sites, Native American cultural sites, or historic buildings or structures or to change the characteristics of a property that would diminish qualities that contribute to its historic significance or cultural importance. Native American archaeological sites have been recorded or may be present at most of the proposed new sites, including Chacahoula (underwater), Clovelly (underwater), Richton, Stratton Ridge, and all three proposed expansion sites. The proposed pipeline corridors for Chacahoula are near major streams and tributaries, which are high-sensitivity areas for both Native American archaeological sites and historic sites such as plantations. Also, the Richton and Stratton Ridge pipelines would pass near or through historically and archaeologically sensitive areas. Where possible, damage to these resources would be avoided. Where avoidance is not possible, DOE would undertake mitigation measures, such as, data recovery from an archaeological site or detailed documentation of a building or structure.

SPR development at the Bruinsburg site could result in potential adverse effects on the historic setting of the Civil War landing of the Union Army in Mississippi and an associated route of troop movements in an area that could become eligible for the National Register of Historic Places as a core study area. The floodplain where the Bruinsburg storage caverns would be developed is the site where the Union Army,

under General Grant, disembarked after crossing the Mississippi River on April 30, 1863, to begin the invasion of Mississippi that culminated in the surrender of Vicksburg on July 4, 1863. A portion of the Bruinsburg site is likely to contain archaeological remains of troop presence. Remains of at least one of the ships that sank during the invasion are likely to lie northwest of the facility boundary. The historic Bruinsburg Road is reportedly still visible on the floodplain and along the route of the climb up to the escarpment.

Construction activities on the floodplain where storage caverns would be built might affect remains associated with the troop landing or prehistoric sites and would affect the setting and feeling of the troop-landing site. Construction activities on the escarpment where the rest of the storage site facilities would be built could affect remains associated with the historic line of the march of the Vicksburg campaign or prehistoric sites.

Several measures could mitigate the effects of altering the setting at the troop-landing site, which is already changed from the original site because the river channel moved westerly and the town of Bruinsburg was abandoned. The mitigation measures could include improved access for history students to the area by the access road to the new facility, possibly including construction of a viewpoint on the descent of the escarpment. In addition, another mitigation measure might be financial support to the National Park Service interpretive program. Currently, access is possible only by special permission from the private landowner; interpretive signs are posted only along public roads, not at the actual site. Damage or destruction of archaeological remains associated with the landing and troop movements would be mitigated through avoidance, if possible, or data would be recovered if damage or destruction of the remains were not avoidable. The current conceptual design for the site, with most buildings and other surface structures on the escarpment, would minimize the effect on the landing area.

S.6.9 Noise

Noise from constructing the proposed storage sites would be audible to the closest receptors for the proposed new and expansion storage sites. The estimated noise levels, however, would have minor impacts because the noise levels would be only slightly greater than the estimated ambient noise levels. The construction noise impacts along the pipelines and at other infrastructure locations also would be small. The level of noise from operations and maintenance activities would be lower than from construction activities. At several proposed storage sites, the noise levels would not be audible, that is, they would be lower than estimated ambient noise levels.

S.6.10 Environmental Justice

The potentially affected populations for each alternative include low-income, Black or African American, Native American or Alaska Native, Asian, and Hispanic or Latino populations. The Stratton Ridge alternative also includes Native Hawaiian or Other Pacific Islander populations. None of these populations would have impacts that appreciably exceed the impacts to the general population. Furthermore, none of the populations would be affected in different ways than the general population, such as by having unique exposure pathways, unique rates of exposure, or special sensitivities or by using natural resources differently. Thus, there would be no disproportionately high and adverse impacts to minority or low-income populations.

S.6.11 Comparison Across Alternatives

This section contains two tables that identify impacts in each resource area.

- Table S.6.11-1 describes the potential impacts for each alternative with three expansion sites, which would be Bayou Choctaw, Big Hill, and West Hackberry, and for the no-action alternative. (See table S.3.4-1 for further detail on the alternatives.)
- Table S.6.11-2 addresses the difference between the alternatives in the first table, which have three expansion sites, and the remaining alternatives, which have just two expansion sites. In other words, the second table focuses on the differences associated with not expanding West Hackberry and increasing the expansion capacity at Big Hill. (It does not address Bayou Choctaw because the same expansion capacity would be developed under both sets of alternatives.)

The second table does not address the Clovelly alternative because Clovelly (without Bruinsburg) would be developed only with three expansion sites. The second table also does not repeat the discussion of the no-action alternative.

S.7 CUMULATIVE IMPACTS

Other past, present, and reasonably foreseeable projects that could cause cumulative impacts in combination with the proposed action include projects such as pipelines, oil and gas development, roads, flood control, and real estate development in general. Both the largest direct effects and the most important cumulative impacts would be to wetlands. The draft EIS assessed the cumulative effects to water resources, but found negligible effects. Based on currently available information on past, present, or reasonably foreseeable projects, DOE does not expect the cumulative effects to threatened and endangered species to be significant.

The Chacahoula alternative, including the Chacahoula storage site and two of the three SPR expansion sites (Bayou Choctaw and West Hackberry), would affect the most acres of wetlands of any alternative in combination with other projects in the same ecosystem. The Clovelly alternative would have the smallest effect in combination with other projects. Louisiana has lost substantial amounts of wetlands associated with agricultural activities, land development, natural land subsidence, and erosive forces over many decades.

For the Bruinsburg alternative, with the exception of one of the proposed crude oil pipelines and a new casino affecting the same wetlands, there are no other potential projects nearby. There are no existing or proposed projects near the Richton alternative that would have a meaningful cumulative effect. In general, however, Mississippi wetlands have been under significant development pressure in recent decades due to agricultural activities and more recently from residential and commercial coastal development.

Several highway-widening projects would intersect the pipelines for the Stratton Ridge alternative and may cause localized cumulative effects to wetlands. In general, the coastal wetlands of Texas have also come under similar pressures as Louisiana and Mississippi.

Table S.6.11-1: Comparison of Impacts for Alternatives with Three Expansion Sites and No-Action Alternative

| Resource | Bruinsburg | Chacahoula | Clovelly | Clovelly 80 MMB/ Bruinsburg 80 MMB | Clovelly 90 MMB/ Bruinsburg 80 MMB | Richton | Stratton Ridge | No-Action |
|---|--|--|---|--|---|---|---|------------|
| Environmental Risks and Public and Occupational Safety and Health | <p>Possible oil spills during initial fill. 16 oil spills predicted.</p> <p>Possible brine spills during the solution mining of caverns and fill. 96 brine spills predicted.</p> <p>Most oil, brine, or hazardous materials spills would be small and occur at storage sites where they would be controlled and kept from sensitive areas. Project lifetime risks would be low.</p> <p>Low likelihood of fire.</p> <p>Number of occupational injuries (0.83 workdays per 200,000 worker hours) would be less than similar industries, based on SPR experience.</p> | Same impacts as under Bruinsburg alternative. | Same impacts as under Bruinsburg alternative. | Same impacts as under Bruinsburg alternative. | Same impacts as under Bruinsburg alternative. | Same impacts as under Bruinsburg alternative. | Same impacts as under Bruinsburg alternative. | No impact. |
| Land Use: Land Use Conflicts | <p>3,470 acres committed for alternative. Most acreage would be for pipeline and power line ROWs.</p> <p>Potential minor conflict where pipeline would cross Natchez Trace National Scenic Trail and Natchez Parkway in an expanded existing ROW and where pipeline would cross 6.8 miles of proclamation area of Homochitto National Forest.</p> | <p>2,884 acres committed for alternative. Most acreage would be for pipeline and power line ROWs.</p> <p>No potential land-use conflicts.</p> | <p>693 acres committed for alternative. Most acreage would be for storage site, which would be within an existing private facility.</p> <p>No potential land-use conflicts.</p> | <p>1,757 acres committed for alternative. Most acreage would be for pipeline and power line ROWs.</p> <p>Potential minor conflict where Bruinsburg pipeline would cross Natchez Trace National Scenic Trail and Natchez Trace Parkway in existing ROW.</p> | <p>2,257 acres committed for alternative. Same land use conflicts as under Clovelly 80 MMB/Bruinsburg 80 MMB alternative.</p> <p>No potential land-use conflicts.</p> | <p>4,494 acres committed for alternative. Most acreage would be for pipeline and power line ROWs.</p> <p>No potential land-use conflicts.</p> | <p>2,191 acres committed for alternative. Most acreage would be for pipeline and power line ROWs.</p> <p>Potential conflict where the pipelines and power lines would cross 3 miles and pipeline would cross 4.7 miles of Brazoria National Wildlife Refuge in existing and new ROWs, respectively.</p> | No impact. |
| Land Use: Visual Resources | <p>Potential visual impacts due to changes in historic Civil War landscape. Potential changes in vegetation where Bruinsburg pipeline ROW would cross Natchez Trace National Scenic Trail, Natchez Trail Parkway, and proclamation area of Homochitto National Forest.</p> | <p>No substantial visual impacts because of limited changes in viewshed, limited access, and lack of proximity to areas with visual sensitivity.</p> | <p>No substantial visual impacts because of location in existing industrial area.</p> | <p>Potential visual impact due to changes in historic Civil War landscape. Potential changes in vegetation where Bruinsburg pipeline ROW would cross Natchez Trace National Scenic Trail and Natchez Trace Parkway.</p> | <p>Same visual impacts as under Clovelly 90 MMB/Bruinsburg 80 MMB alternative.</p> | <p>Same visual impacts as Chacahoula.</p> | <p>Potential visual impact due to changes in vegetation and new power lines from ROW across Brazoria National Wildlife Refuge. Potential visual impacts from RWI across ICW from the Refuge.</p> | No impact. |
| Land Use: Farmland Conversion | <p>Would not have a substantial impact in converting prime and unique farmland to non-agricultural use. Farmland impact score under Farmland Protection Act regulations (7 CFR Part 658) is below level where further consideration of farmland protection is required.</p> | <p>Same farmland conversion impact as under Bruinsburg alternative.</p> | <p>Same farmland conversion impact as under Bruinsburg alternative.</p> | <p>Same farmland conversion impact as under Bruinsburg alternative.</p> | <p>Same farmland conversion impact as under Bruinsburg alternative.</p> | <p>Same farmland conversion impact as under Bruinsburg alternative.</p> | <p>Same farmland conversion impact as under Bruinsburg alternative.</p> | No impact. |

Table S.6.11-1: Comparison of Impacts for Alternatives with Three Expansion Sites and No-Action Alternative

| Resource | Bruinsburg | Chacahoula | Clovelly | Clovelly 80 MMB/ Bruinsburg 80 MMB | Clovelly 90 MMB/ Bruinsburg 80 MMB | Richton | Stratton Ridge | No-Action |
|---|---|--|---|---|--|---|---|---|
| Land Use: Coastal Zone Management | Some of the Bruinsburg infrastructure and Big Hill site and infrastructure and West Hackberry site and infrastructure would be in coastal zones. DOE and the state coastal zone agency will use the Clean Water Act Section 404 wetlands permitting process to reach a determination on coastal consistency. | Same coastal zone management impacts as under Bruinsburg alternative. Same coastal zone determination process as under Bruinsburg alternative. | Clovelly site, some of the Bruinsburg infrastructure, Big Hill site and infrastructure, and West Hackberry site would be in coastal zones. Same coastal zone determination process as under Bruinsburg alternative. | Clovelly site, Big Hill site and infrastructure, and West Hackberry site would be in coastal zones. Same coastal zone determination process as under Bruinsburg alternative. | Same coastal zone management impacts as under Clovelly 80 MMB/ Bruinsburg 80 MMB alternative. Same coastal zone determination process as under Bruinsburg alternative. | Some of Richton infrastructure, Big Hill site and infrastructure, and West Hackberry site would be in coastal zones. Same coastal zone determination process as under Bruinsburg alternative. | Stratton Ridge site and infrastructure, Big Hill site and infrastructure, and West Hackberry site would be in coastal zones. Same coastal zone determination process as under Bruinsburg alternative. | No impact. |
| Geology and Soils | Potential minor surface subsidence (2.6 to 6.1 feet over 30 years). Cavern construction and use would not interfere with use of other caverns on the salt dome. | Potential minor surface subsidence (1.8 to 6.4 feet over 30 years). Cavern construction and use would not interfere with use of other caverns on the salt dome. | Potential minor surface subsidence (5 feet over 30 years). Cavern construction and use would not interfere with use of other caverns on the salt dome. | Potential minor surface subsidence (2.8 to 6.4 feet over 30 years). Cavern construction and use would not interfere with use of other caverns on the salt dome. | Potential minor surface subsidence (1 to 3 feet at Bruinsburg salt dome and 2.1 to 4.9 feet at Clovelly salt dome, over 30 years). Cavern construction and use would not interfere with use of other caverns on the salt dome. | Potential minor surface subsidence (1 to 3 feet at Bruinsburg and slightly more than 2.1 to 4.9 feet at Clovelly salt dome, over 30 years). Cavern construction and use would not interfere with use of other caverns on the salt dome. | Potential minor surface subsidence (2.6 to 6.1 feet over 30 years). Cavern construction and use would not interfere with use of other caverns on the salt dome. | No potential subsidence, except possibly from future outside development of Chacahoula and Stratton Ridge salt domes. |
| Air Quality | Low airborne emissions from construction activities would not exceed National Ambient Air Quality Standards. Emissions levels would be below levels of concern, including below conformity determination thresholds in the ozone nonattainment areas at Bayou Choctaw and Big Hill. Low emissions of greenhouse gases from construction equipment and motor vehicles. | Same air quality impacts as under Bruinsburg alternative. | Same air quality impacts as under Bruinsburg alternative. | Same air quality impacts as under Bruinsburg alternative. | Same air quality impacts as under Bruinsburg alternative. | Same air quality impacts as under Bruinsburg alternative. | Same as Bruinsburg, except that emission levels would be below the conformity determination threshold in the ozone nonattainment areas at Stratton Ridge. Since estimated levels are only slightly below level that triggers a full conformity review, DOE would conduct additional analysis if Stratton Ridge were selected. | No impact. |
| Water Resources: Surface Water | Construction activities would cause temporary and minor erosion and sedimentation. DOE would secure an Erosion and Sediment Control Permit and NPDES stormwater permit for construction activities. No significant water quality problems would result. Construction and operation would potentially affect 35 waterbodies for Bruinsburg site and infrastructure and 12, 4, and 3 water bodies for the expansions at Bayou Choctaw, Big Hill, and West Hackberry, respectively. | Same erosion and sedimentation impacts as under Bruinsburg alternative. Chacahoula site and infrastructure would potentially affect 18 waterbodies. Same waterbodies for expansion sites as under Bruinsburg alternative. | Same erosion and sedimentation impacts as under Bruinsburg alternative. Clovelly site and infrastructure would potentially affect 4 water bodies and a small amount of dredging and filling of existing canals would be required at Chacahoula. Same water bodies for expansion sites as under Bruinsburg alternative. | Same erosion and sedimentation impacts as individual Clovelly and Bruinsburg alternatives, but the disturbance footprint at each site would be smaller. Clovelly 80 MMB/Bruinsburg 80 MMB and Clovelly site and infrastructure would potentially affect 16 waterbodies. Same water bodies for expansion sites as under Bruinsburg alternative. | Same erosion and sedimentation impacts as Clovelly 80 MMB/Bruinsburg 80 MMB alternative. Same water bodies affected as under Clovelly 80 MMB/ Bruinsburg 80 MMB alternative. | Same erosion and sedimentation impacts as under Bruinsburg alternative. Richton site and infrastructure would potentially affect 63 water bodies. Same water bodies for expansion sites as under Bruinsburg alternative. | Same erosion and sedimentation impacts as under Bruinsburg alternative. Stratton Ridge site and infrastructure would potentially affect 17 waterbodies. Same water bodies for expansion sites as under Bruinsburg alternative. | No impact unless Chacahoula or Clovelly were developed by a commercial entity. |

Table S.6.11-1: Comparison of Impacts for Alternatives with Three Expansion Sites and No-Action Alternative

| Resource | Bruinsburg | Chacahoula | Clovelly | Clovelly 80 MMB/ Bruinsburg 80 MMB | Clovelly 90 MMB/ Bruinsburg 80 MMB | Richton | Stratton Ridge | No-Action |
|--|--|--|---|--|--|--|--|-----------|
| Water Resources: Surface Water (continued) | <p>DOE would secure a Section 404 permit and Section 401 Water Quality Certificate for construction activities in jurisdictional waterbodies.</p> <p>There would be a potential for significant water quality consequences if a brine or oil release occurred and it traveled into a waterbody. The risk of such a release is small based on the history of existing SPR facilities.</p> <p>Bruinsburg RWI would withdraw 50 million gallons/day for 4 to 5 years from Mississippi River, which is a small fraction of its flow.</p> <p>Big Hill and West Hackberry expansions would use existing RWIs from ICW without changing existing conditions. Bayou Choctaw would withdraw 25 million gallons/day from Cavern Lake, which is fed by the ICW, for up to 3 years. Withdrawals would not significantly alter the flow or volume of water, but may cause a slight upstream migration of the salinity gradient.</p> | <p>Same requirements as under Bruinsburg alternative for construction activities in jurisdictional waterbodies.</p> <p>Same spill risk as under Bruinsburg alternative.</p> <p>Chacahoula RWI would withdraw 50 million gallons/day for 4 to 5 years from the ICW, a tidally influenced waterbody. Withdrawal would not significantly change the ICW water flow or volume, but may cause a slight upstream migration of the salinity gradient.</p> <p>The impact from water withdrawal for Bayou Choctaw, Big Hill, and West Hackberry expansions would be the same as under Bruinsburg alternative.</p> | <p>Same requirements as under Bruinsburg alternative for construction activities in jurisdictional waterbodies.</p> <p>Same spill risk as under Bruinsburg alternative.</p> <p>Clovelly RWI would withdraw 50 million gallons/day for 4 to 5 years from a tidal canal in network of interconnected canals at LOOP complex. Withdrawal would not significantly change flow or volume of water in the canal system, but may cause a slight upstream migration of the salinity gradient.</p> <p>The impact from water withdrawal for the Bayou Choctaw, Big Hill, and West Hackberry expansions would be the same as under Bruinsburg alternative.</p> | <p>Same requirements as under Bruinsburg alternative for construction activities in jurisdictional waterbodies.</p> <p>Same spill risk as under Bruinsburg alternative.</p> <p>Clovelly and Bruinsburg RWIs would have a similar but impact as Clovelly RWI and Bruinsburg RWI, except withdrawals would occur for a shorter duration.</p> <p>Impact from water withdrawal for Bayou Choctaw, Big Hill, and West Hackberry expansions would be the same as under Bruinsburg alternative.</p> | <p>Same requirements as under Bruinsburg alternative for construction activities in jurisdictional waterbodies.</p> <p>Same spill risk as under Bruinsburg alternative.</p> <p>Similar impact from RWI as under Clovelly 80MMB/ Bruinsburg 80 MMB alternative, except that water withdrawal would have a slightly longer duration.</p> <p>Impact from water withdrawal would be similar as under Clovelly 80MMB/Bruinsburg 80 MMB alternative, except that the brine discharge for Clovelly would have a slightly longer duration.</p> | <p>Same requirements as under Bruinsburg alternative for construction activities in jurisdictional waterbodies.</p> <p>Same spill risk as under Bruinsburg alternative.</p> <p>Richton RWI would withdraw 50 million gallons/day for 4 to 5 years from the Leaf River, which would be about 2 percent of average flow rate. Withdrawal would potentially exceed the 7-day, 10 year low flow rate, which is the minimum instream flow allowed by Mississippi. Historical data show that Leaf River flow would be sufficient to meet the water demand about 99 percent of the time. During low flow years, flow could be below the minimum instream flow for up to 15 percent of the time. DOE would secure a Beneficial Use of Public Waters Permit from Mississippi.</p> <p>Impact from water withdrawal for Bayou Choctaw, Big Hill, and West Hackberry expansions would be same as under Bruinsburg alternative.</p> | <p>Same requirements as under Bruinsburg alternative for construction activities in jurisdictional waterbodies.</p> <p>Same spill risk as under Bruinsburg alternative.</p> <p>Stratton Ridge RWI would withdraw 42 million gallons/day for 4 to 5 years from ICW, a tidally influenced waterbody. Withdrawal would not significantly change the ICW water flow or volume, but may cause a slight upstream migration of the salinity gradient.</p> <p>Impact from water withdrawal for Bayou Choctaw, Big Hill, and West Hackberry expansions would be the same as under Bruinsburg alternative.</p> | |

Table S.6.11-1: Comparison of Impacts for Alternatives with Three Expansion Sites and No-Action Alternative

| Resource | Bruinsburg | Chacahoula | Clovelly | Clovelly 80 MMB/ Bruinsburg 80 MMB | Clovelly 90 MMB/ Bruinsburg 80 MMB | Richton | Stratton Ridge | No-Action |
|--|---|---|--|--|--|---|--|------------|
| Water Resources: Surface Water (continued) | <p>No discharge from Bruinsburg to Gulf of Mexico. Brine would be injected underground.</p> <p>Big Hill expansion would discharge brine into Gulf of Mexico using existing brine diffusers and within existing NPDES permitted limits. Small increases in salinity levels (modeling indicated a maximum of 4.7 parts per thousand) would occur from the discharge, but increase would be within natural salinity variation.</p> | <p>Chacahoula site would discharge brine into Gulf of Mexico for up to 3 years. Discharge would be located in a trough to the north of Ship Shoal, an important fishing area. Brine plume would typically not affect Ship Shoal although a minor salinity increase may occur under some ocean conditions. DOE would secure a National Pollutant Discharge Elimination System permit from Louisiana. Small increases in salinity levels (modeling indicated a maximum of 4.7 parts per thousand) would occur from the discharge but the increases would be within natural salinity variation.</p> <p>Impact of the Big Hill brine discharge would be the same as under Bruinsburg alternative.</p> | <p>Clovelly site would discharge brine into Gulf of Mexico using an existing brine diffuser system and within existing National Pollutant Discharge Elimination System permitted limits. Small increases in salinity levels (modeling indicated a maximum of 4.7 parts per thousand) would occur from the discharge, but the increase would be within natural salinity variation.</p> <p>Impact of the Big Hill brine discharge would be the same as under Bruinsburg alternative.</p> | <p>Clovelly site would have a similar impact to the brine discharge from the Clovelly alternative, except that discharge would have a shorter duration.</p> <p>Impact of the Big Hill brine discharge would be the same as under Bruinsburg alternative.</p> | <p>Same brine discharge impact as under Clovelly 80 MMB/ Bruinsburg 80 MMB alternative, except that discharge would have a shorter duration.</p> | <p>Richton site would discharge brine into Gulf of Mexico using up to 75 diffusers. DOE would secure an NPDES discharge permit from Mississippi. Small increases in salinity levels (modeling indicated a maximum of 4.7 parts per thousand) would occur from the discharge, but the increases would be within natural salinity variation.</p> <p>Impact of Big Hill brine discharge would be the same as under Bruinsburg alternative.</p> | <p>Stratton Ridge site would discharge brine into the Gulf of Mexico using up to 75 diffusers. DOE would secure a National Pollutant Discharge Elimination System permit from Texas for the brine discharge. Small increases in salinity levels (modeling indicated a maximum of 4.7 parts per thousand) would occur from the discharge but the increases would be within natural salinity variation.</p> <p>Impact of the Big Hill brine discharge would be the same as under Bruinsburg alternative.</p> | |
| Water Resources: Groundwater | <p>Bruinsburg pipelines would cross multiple areas with programs protecting against contaminating groundwater that is used as a source of drinking water (source water protection areas); however, risk of groundwater contamination from pipeline spills is low.</p> <p>Bruinsburg, Bayou Choctaw, and West Hackberry would use deep-aquifer brine injection. These sites have confined aquifers separated by impermeable strata. The proposed brine injection wells would be permitted by U.S. Environmental Protection Agency and/or appropriate state agency.</p> | <p>Chacahoula pipelines would not cross source water protection areas.</p> <p>Bayou Choctaw and West Hackberry use deep-aquifer brine injection. These sites have confined aquifers separated by impermeable strata. The proposed brine injection wells would be permitted by U.S. Environmental Protection Agency and/or appropriate state agency.</p> | <p>Existing pipelines at Clovelly do not cross source water protection areas. Shallow groundwater at Clovelly is not potable. Any discharge to groundwater would have little impact on water use in area. Relatively impermeable clay/silt layer overlays the aquifer system.</p> <p>Brine injection at Bayou Choctaw and West Hackberry would be same as under Chacahoula alternative.</p> | <p>Impacts to groundwater are similar to those discussed for Bruinsburg alternative and Clovelly alternative, except that the number of brine injection wells at Bruinsburg would be reduced from 60 to 30.</p> | <p>Impacts to groundwater would be same as under Clovelly 80/Bruinsburg 80 MMB alternative.</p> | <p>Richton pipelines would be constructed through and adjacent to several groundwater protection areas; however, risk of groundwater contamination from pipeline spills is low.</p> <p>Brine injection at Bayou Choctaw and West Hackberry would be same as under Chacahoula alternative.</p> | <p>Stratton Ridge pipelines would be constructed through and adjacent to several areas serving public water systems or important to groundwater recharge; however, risk of groundwater contamination from pipeline spills is low.</p> <p>Brine injection at Bayou Choctaw and West Hackberry would be same as under Chacahoula alternative.</p> | No impact. |

Table S.6.11-1: Comparison of Impacts for Alternatives with Three Expansion Sites and No-Action Alternative

| Resource | Bruinsburg | Chacahoula | Clovelly | Clovelly 80 MMB/ Bruinsburg 80 MMB | Clovelly 90 MMB/ Bruinsburg 80 MMB | Richton | Stratton Ridge | No-Action |
|--|---|---|--|---|--|---|--|------------|
| Water Resources: Groundwater (Continued) | At Bruinsburg, the total disposal capacity of the proposed injection formations and the pressure build-up likely to occur as a result of brine injection are currently unknown. If DOE were to select this alternative, the total disposal capacity and pressure build-up would be determined during the development of the detailed design. | | | | | | | |
| Water Resources: Floodplains | <p>Construction of Bruinsburg storage site, three expansion storage sites, RWIs, and other facilities except ROWs would affect 276 acres of 100-year floodplain and 48 acres of 500-year floodplain. Buildings at Bruinsburg would not be in floodplain. Wellheads, well pads, and roads would involve placing fill or infrastructure in a floodplain. DOE would comply with floodplain protection requirements during design and construction so that the base flood elevation and downstream land uses would not be significantly affected.</p> <p>ROWs for the Bruinsburg site and three expansion sites would temporarily affect 48 miles of 100-year floodplain and 7 miles of 500-year floodplain. Floodplain would not be permanently affected by the ROWs because no aboveground fill or structures would be placed in the floodplain after construction is complete.</p> | <p>Construction of Chacahoula storage site, three expansion storage sites, RWIs, and other facilities except ROWs would affect 171 acres of 100-year floodplain and 27 acres of 500-year floodplain, much of which would be filled. Some interior areas of the storage site would not be filled and would retain their flood storage capacity. The entire storage site at Chacahoula is located in a vast floodplain that extends to the Gulf of Mexico. Site floodplain requirements and impacts would be same as under Bruinsburg alternative.</p> <p>ROWs for the Chacahoula site and three expansion sites would temporarily affect 109 miles of 100-year and 3 miles of 500-year floodplain. ROW floodplain impacts would be same as under Bruinsburg alternative.</p> | <p>Construction of Clovelly storage site, three expansion storage sites, RWIs, and other facilities except ROWs would affect 56 acres of 100-year floodplain and 27 acres of 500-year floodplain. All of the Clovelly site would be located in the floodplain, but the facility would be built on an elevated platform that would place much of the infrastructure above the base flood elevation. Administrative buildings would be located offsite and out of the floodplain. Site floodplain requirements and impacts would be same as under Bruinsburg alternative.</p> <p>ROWs for the Bruinsburg site and three expansion sites would temporarily affect 18 miles of 100-year floodplain and 3 miles of 500-year floodplain. ROW floodplain impacts would be same as under Bruinsburg alternative.</p> | <p>Construction of the Clovelly and Bruinsburg storage sites, three expansion storage sites, RWIs, and other facilities except ROWs would affect 136 acres of 100-year floodplain and 48 acres of 500-year floodplain. Site floodplain requirements and impacts would be same as under Bruinsburg alternative.</p> <p>ROWs for the Clovelly-Bruinsburg alternative, including three expansion sites would temporarily affect 55 miles of 100-year and 7 miles of 500-year floodplain. ROW floodplain impacts would be same as under Bruinsburg alternative.</p> | Same floodplain impacts as under Clovelly 80 MMB/ Bruinsburg 80 MMB alternative. | <p>Construction of Richton storage site, three expansion storage sites, RWIs, and other facilities except ROWs would affect 98 acres of 100-year floodplain and 27 acres of 500-year floodplain. Site floodplain requirements and impacts would be same as under Bruinsburg alternative.</p> <p>ROWs for the Bruinsburg site and three expansion sites would temporarily affect 45 miles of 100-year floodplain and 6 miles of 500-year floodplain. ROW floodplain impacts would be same as under Bruinsburg alternative.</p> | <p>Construction of Stratton Ridge storage site, three expansion storage sites, RWIs, and other facilities except ROWs would affect 159 acres of 100-year floodplain and 213 acres of 500-year floodplain. Site floodplain requirements and impacts would be same as under Bruinsburg alternative.</p> <p>ROWs for the Stratton Ridge site and three expansion sites would temporarily affect 59 miles of 100-year and 11 miles of 500-year floodplain. ROW floodplain impacts would be same as under Bruinsburg alternative.</p> | No impact. |

Table S.6.11-1: Comparison of Impacts for Alternatives with Three Expansion Sites and No-Action Alternative

| Resource | Bruinsburg | Chacahoula | Clovelly | Clovelly 80 MMB/ Bruinsburg 80 MMB | Clovelly 90 MMB/ Bruinsburg 80 MMB | Richton | Stratton Ridge | No-Action |
|---|---|--|---|---|--|---|---|------------|
| Biological Resources: Plants, Wetlands, and Wildlife | Construction of Bruinsburg storage site, three expansion storage sites, RWIs, and other facilities except ROWs would permanently fill 150 acres of wetlands including 85 acres of relatively rare and ecologically important bald cypress forest for the storage site area. Security buffer at Bruinsburg, West Hackberry, and Big Hill storage sites would cause a permanent conversion of 25 acres of forested and scrub-shrub wetlands to emergent wetlands. | Construction of Chacahoula site, three expansion storage sites, RWIs, and other facilities except ROWs would permanently fill 175 acres of wetlands including 126 acres of ecologically and economically important bald cypress forest for the storage site area. The clearing of an additional 213 acres of bald cypress and other forested wetlands for security at Chacahoula and the expansion sites would be a permanent conversion to emergent wetlands or open water. | Construction of Clovelly storage site, three expansion storage sites, RWIs, and other facilities except ROWs would permanently fill or dredge 49 acres of disturbed and relatively low value wetlands. It would cause a permanent conversion of 7 acres of forested and scrub-shrub wetland to emergent wetlands for security and other clearing at Clovelly, Big Hill, and West Hackberry. | Construction of the Clovelly and Bruinsburg storage sites, three expansion storage sites, RWIs, and other facilities except ROWs would permanently fill 86 acres of wetlands, including up to 39 acres of relatively rare and ecologically important bald cypress forest for the site storage area at Bruinsburg. It would cause a permanent conversion of 23 acres of forested and scrub-shrub wetland to emergent wetlands for security and other clearing at Clovelly, Big Hill, and West Hackberry. | Same wetlands impacts as under Clovelly 80 MMB/ Bruinsburg 80 MMB alternative. | Construction of Richton storage site, three expansion storage sites, RWIs, and other facilities except ROWs would permanently fill 90 acres of wetlands, including 34 acres of disturbed low value emergent wetlands at the Pascagoula terminal site. Security buffer at Richton, Big Hill, and West Hackberry storage sites would cause a permanent conversion of 9 acres of forested and scrub-shrub wetlands to emergent wetlands. | Construction of Stratton Ridge storage site, three expansion storage sites, RWIs, and other facilities except ROWs would permanently fill 277 acres of wetlands, including up to 258 acres of relatively rare and ecologically important bottomland hardwood for the site storage area. Security buffer at Stratton Ridge, West Hackberry, and Big Hill storage sites would cause a permanent conversion of 80 acres of forested and scrub-shrub wetlands to emergent wetlands. | No impact. |
| | Proposed ROWs for Bruinsburg and three expansion sites would affect 211 acres of wetlands within the permanently maintained easement and 306 acres within the temporary construction easement. Wetlands in the permanently maintained easement would be converted to emergent wetlands and would be periodically maintained to suppress woody species. | Proposed ROWs for Chacahoula and three expansion sites would affect 867 acres of wetlands within the permanently maintained easement and 1,222 acres within the temporary construction easement. | Proposed Clovelly site does not require pipeline or power line ROW construction. The proposed ROWs for three expansion sites would affect 60 acres of wetlands within the permanently maintained easement and 122 acres within the temporary construction easement. | Proposed ROWs for Clovelly-Bruinsburg and the three expansion sites would affect 251 acres of wetlands within the permanently maintained easement and 398 acres within the temporary construction easement. | | The proposed ROWs for Richton and the three expansion sites would affect 527 acres of wetlands within the permanently maintained easement and 907 acres within the temporary construction easement. . | The proposed ROWs for Stratton Ridge and the three expansion sites would affect 181 acres of wetlands within the permanently maintained easement and 288 acres within the temporary construction easement. | |
| | Wetlands within the temporary construction easement would be cleared during construction, but would re-establish within 2-25 years depending on the type of wetland affected. | Nature of wetland impacts would be same as under Bruinsburg alternative. | Nature of wetland impacts would be same as under Bruinsburg alternative. | Nature of wetland impacts would be same as under Bruinsburg alternative. | | Nature of Wetland impacts would be same as under Bruinsburg alternative. | Nature of wetland impacts would be same as under Bruinsburg alternative. | |

Table S.6.11-1: Comparison of Impacts for Alternatives with Three Expansion Sites and No-Action Alternative

| Resource | Bruinsburg | Chacahoula | Clovelly | Clovelly 80 MMB/ Bruinsburg 80 MMB | Clovelly 90 MMB/ Bruinsburg 80 MMB | Richton | Stratton Ridge | No-Action |
|---|---|---|---|---|---------------------------------------|--|---|-----------|
| Biological Resources: Plants, Wetlands, and Wildlife (continued) | Impact from permanent filling of wetlands and permanent conversion would be a potentially adverse affect because of the impact size and the regional importance of the forested wetlands, but would be mitigated. DOE would complete a wetland delineation, secure a jurisdictional determination, and secure Section 404/401 permits for all impacts to jurisdictional wetlands. DOE would develop a comprehensive plan to further avoid and minimize wetland impacts and to mitigate for unavoidable impacts to jurisdictional wetlands by creating, restoring, or preserving wetlands, contributing an in-lieu of fee, or purchasing credits from a mitigation bank. | The impact from the permanent filling of wetlands and permanent conversion would be the same as under Bruinsburg alternative. | The impact from permanent filling of wetlands and permanent conversion would be relatively moderate because the wetlands have already been disturbed by past development, have been invaded by tallow tree, and they are not regionally important. DOE would undertake the same wetland activities as under the Bruinsburg alternative. | The impact from the permanent filling of wetlands and permanent conversion would be the same as under Bruinsburg alternative. | | The impact from ROWs is a potentially adverse affect because of the size of the impact (over 600 acres) to palustrine forested and scrub-shrub wetlands. The impact would be mitigated. DOE would undertake the same wetland activities as under Bruinsburg alternative. | The impact from the permanent filling of wetlands and permanent conversion is a potentially adverse affect because of the size of the impact and the regional importance of the forested wetlands. Some of the forested wetlands at the Stratton Ridge site have relatively low ecological value because of invasion by exotic plants and animals. DOE would undertake the same wetland activities as under Bruinsburg alternative. | |

Table S.6.11-1: Comparison of Impacts for Alternatives with Three Expansion Sites and No-Action Alternative

| Resource | Bruinsburg | Chacahoula | Clovelly | Clovelly 80 MMB/ Bruinsburg 80 MMB | Clovelly 90 MMB/ Bruinsburg 80 MMB | Richton | Stratton Ridge | No-Action |
|--|---|--|--|---|---|---|---|------------|
| Biological Resources: Threatened and Endangered Species | Proposed ROW for Bruinsburg may affect the fat pocketbook mussel, a Federally endangered species, which may be present in Coles and Fairchild Creeks. Proposed RWI for the Bruinsburg site may affect the pallid sturgeon, a Federally endangered species that lives in the Mississippi River because of the potential for impingement and entrainment of juveniles. DOE would initiate formal Section 7 consultation with USFWS and NOAA Fisheries, prepare a Biological Assessment, and implement conditions of Biological Opinion if project may adversely affect these species. | Proposed site storage area for the Chacahoula site and all proposed ROWs may affect the Bald Eagle, a Federally threatened species that is proposed for de-listing, by removing potential foraging, roosting, and nesting habitat. Proposed ROW for the crude oil pipeline to Clovelly may affect the brown pelican, which is a Federally endangered species. The brown pelican has roosting habitat near the proposed ROW. DOE would initiate formal Section 7 consultation with USFWS and prepare a Biological Assessment, and implement conditions of Biological Opinion if project may adversely affect these species. | Proposed Clovelly site would not affect any Federally listed species. | Bruinsburg RWI may affect the pallid sturgeon in the same way as under Bruinsburg alternative, but the fat pocketbook mussel would not be affected because Bruinsburg 80 MMB proposed pipelines and shorter brine pipeline would not cross waterbodies inhabited by the mussel. | Same as Clovelly 80 MMB/ Bruinsburg 80 MMB alternative. | The proposed storage site, ROWs, and RWI may affect the Federally threatened gopher tortoise and the Federal candidate black pine snake. Potential impacts include loss of habitat or individuals from the construction. Proposed RWI may affect the Federally endangered yellow blotched map turtle and Gulf sturgeon, and the Federal candidate pearl darter. The adverse affect may occur because of the potential for impingement and entrainment of early life stages and because the withdrawal could change the hydrological regime preferred by these species. RWI would be located within the segment of the Leaf River, which is designated as critical habitat for the Gulf sturgeon. According to historical flow records, about 27 percent of the time, the withdrawal would exceed the minimum instream flow recommended by Mississippi to protect freshwater fisheries. DOE would initiate formal Section 7 consultation with USFWS and NOAA Fisheries, prepare a Biological Assessment, and implement conditions of Biological Opinion if project may adversely affect a listed species or designated critical habitat. | The proposed site storage area for the Stratton Ridge site, ROWs, and RWI may affect the Bald Eagle, a Federally threatened species that is proposed for de-listing, by removing potential foraging, roosting, and nesting habitat. The Bald Eagle has not been reported within the corridor. DOE would initiate formal Section 7 consultation with USFWS and prepare a Biological Assessment, and implement conditions of Biological Opinion if project may adversely affect these species or designated critical habitat. | No impact. |
| | Proposed expansion at Bayou Choctaw, Big Hill, and West Hackberry would not affect any Federally listed species. | Proposed expansion at Bayou Choctaw, Big Hill, and West Hackberry would not affect any Federally listed species. | Proposed expansion at Bayou Choctaw, Big Hill, and West Hackberry would not affect any Federally listed species. | Proposed expansion at Bayou Choctaw, Big Hill, and West Hackberry would not affect any Federally listed species. | | Proposed expansion at Bayou Choctaw, Big Hill, and West Hackberry would not affect any Federally listed species. | Proposed expansion at Bayou Choctaw, Big Hill, and West Hackberry would not affect any Federally listed species. | |

Table S.6.11-1: Comparison of Impacts for Alternatives with Three Expansion Sites and No-Action Alternative

| Resource | Bruinsburg | Chacahoula | Clovelly | Clovelly 80 MMB/ Bruinsburg 80 MMB | Clovelly 90 MMB/ Bruinsburg 80 MMB | Richton | Stratton Ridge | No-Action |
|---|---|---|--|---|---|---|---|---|
| Biological Resources: Special Status Areas | <p>The pipeline ROW to the Peetsville terminal would cross Natchez Trace Parkway, which is managed by the National Park Service (NPS). The proposed ROW follows existing utility and road corridors and is already disturbed. DOE would coordinate with the NPS to minimize the impacts to important natural resources.</p> <p>Bayou Choctaw, Big Hill, and West Hackberry expansion sites would not affect any special status areas.</p> | No special status areas would be affected by this alternative. | Clovelly site would be located adjacent to the Gulf ICW to Clovelly Hydrologic Restoration project, but would not affect the project. | No special status areas would be affected by this alternative. | No special status areas would be affected by this alternative. | <p>Pipeline to Liberty terminal would pass through 0.5 miles of the Percy Quin State Park. DOE would coordinate with the state park to select a route that would minimize the impacts to important natural and recreational resources.</p> <p>Bayou Choctaw, Big Hill, and West Hackberry expansions would not affect any special status areas.</p> | <p>Crude oil pipeline ROW to Texas City and RWI, brine, and power line ROW would each pass through a portion of the Brazoria National Wildlife Refuge. RWI would be located across the ICW from the refuge. RWI construction and operations may affect sensitive wildlife and migrating birds that inhabit or stop at the refuge. DOE would coordinate with the USFWS and negotiate a final route and construction approach that minimizes the impact to natural resources. DOE would bury the power line through the refuge and use noise attenuation, down-shielded and low mast lighting at RWI to minimize impacts.</p> <p>Bayou Choctaw, Big Hill, and West Hackberry expansion sites would not affect any special status areas.</p> | No impact. |
| Biological Resources: Essential Fish Habitat | Big Hill expansion would cause minor salinity changes from the brine discharge to a small area of EFH in the Gulf of Mexico (modeling indicated a maximum increase of 4.7 parts per thousand). Impact to EFH would be minimal because it represents a very small fraction of the total EFH in the Gulf of Mexico and the managed species are generally tolerant of wider salinity changes than the predicted increase due to the brine discharge. | Chacahoula and Big Hill would have EFH impacts similar to Bruinsburg alternative. Chacahoula would discharge brine near Ship Shoal, an important fishing area. A small salinity increase may be experienced at Ship Shoal. Brine discharge pipeline construction would disturb 1,470,000 square feet of sediment that is EFH. | Clovelly and Big Hill expansion sites would have EFH impacts same as the impacts from Big Hill under Bruinsburg alternative. | Similar impact as under the Clovelly alternative, except that the brine discharge for the Clovelly and Bruinsburg alternative would have a shorter duration. | Similar impact to the Clovelly 80 MMB/Bruinsburg 80 MMB alternative, except that the brine discharge would have a slightly longer duration. | Richton and Big Hill expansion sites would have EFH impacts same as the impacts from Big Hill under Bruinsburg alternative. Brine pipeline construction would disturb 1,062 square feet of sediment that is EFH. | Stratton Ridge and Big Hill expansion sites would have EFH impacts same as the impacts from Big Hill under Bruinsburg alternative. Brine disposal pipeline construction would disturb 320,000 square feet of sediment that is EFH. | No impact. |
| Socioeconomics | <p>Peak construction workforce of 474 for Bruinsburg site and its infrastructure.</p> <p>Peak construction workforce of 100 to 350 employees at expansion sites.</p> <p>Operations and maintenance workforce of 75 to 100 employees at Bruinsburg site and an additional 25 employees at each expansion site.</p> | <p>Peak construction workforce of 445 for Chacahoula and its infrastructure.</p> <p>Same expansion site workforce as under Bruinsburg alternative.</p> <p>Same operations and maintenance workforce as under Bruinsburg alternative.</p> | <p>Peak construction workforce of 238 for Clovelly and its infrastructure.</p> <p>Same expansion site workforce as under Bruinsburg alternative.</p> <p>Same operations and maintenance workforce as under Bruinsburg alternative.</p> | <p>Peak construction workforce of 548 for Clovelly and Bruinsburg and their infrastructure.</p> <p>Same expansion site workforce as under Bruinsburg alternative.</p> <p>Same operations and maintenance workforce as under Bruinsburg alternative, except that there would be 75 to 100 employees at both Clovelly and Bruinsburg.</p> | <p>Same as Clovelly 80 MMB/ Bruinsburg 80MMB.</p> <p>Same expansion site workforce as under Bruinsburg alternative.</p> <p>Same operations and maintenance workforce as under Clovelly 80 MMB/ Bruinsburg 80 MMB alternative.</p> | <p>Peak construction workforce of 499 for Richton and its infrastructure.</p> <p>Same expansion site workforce as under Bruinsburg alternative.</p> <p>Same operations and maintenance workforce as under Bruinsburg alternative.</p> | <p>Peak construction workforce of 431 for Stratton Ridge and its infrastructure.</p> <p>Same expansion site workforce as under Bruinsburg alternative.</p> <p>Same operations and maintenance workforce as under Bruinsburg alternative.</p> | No impact; additional economic impact would not be generated. |

Table S.6.11-1: Comparison of Impacts for Alternatives with Three Expansion Sites and No-Action Alternative

| Resource | Bruinsburg | Chacahoula | Clovelly | Clovelly 80 MMB/ Bruinsburg 80 MMB | Clovelly 90 MMB/ Bruinsburg 80 MMB | Richton | Stratton Ridge | No-Action |
|-------------------------------|---|--|--|--|--|--|---|------------|
| Socioeconomics (continued) | Positive local economic benefits from increased employment. Small in-migration relative to regional population. No noticeable increase in competition for employment, traffic, or demand for housing or public infrastructure or services. | Similar socioeconomic impacts as under Bruinsburg alternative. | Similar socioeconomic impacts as under Bruinsburg alternative. | Similar socioeconomic impacts as under Bruinsburg alternative. | Similar socioeconomic impacts as under Bruinsburg alternative. | Similar socioeconomic impacts as under Bruinsburg alternative. | Similar socioeconomic impacts as under Bruinsburg alternative. | |
| Cultural Resources | <p>Adverse effects to archaeological remains of Civil War activity at Bruinsburg, which could be mitigated. Residual (after mitigation) adverse effects on setting of Civil War landing area and march route.</p> <p>Possible effects to Native American sites at Big Hill, Bayou Choctaw, and West Hackberry, which could be mitigated.</p> | <p>Likely adverse effects to Native American and historic sites along Chacahoula pipeline routes, which could be mitigated.</p> <p>Possible effects to Native American sites at Big Hill, Bayou Choctaw, and West Hackberry, which could be mitigated.</p> | <p>Unlikely residual adverse effects at Clovelly.</p> <p>Possible effects to Native American sites at Big Hill, Bayou Choctaw, and West Hackberry, which could be mitigated.</p> | Same as Bruinsburg and Clovelly alternatives together. | Same as Bruinsburg and Clovelly alternatives together. | <p>Adverse effects to Native American archaeological sites within Richton facility boundary, which could be mitigated. Likely adverse effects to Native American archeological sites along Richton pipelines, which could be mitigated. Possible residual effects to feeling and setting of historic districts along pipelines and at terminal.</p> <p>Possible effects to Native American sites at Big Hill, Bayou Choctaw, and West Hackberry, which could be mitigated.</p> | <p>Adverse effects to Native American archaeological sites at Stratton Ridge facility and along pipelines, which could be mitigated. Possible residual effects to any historic settings along pipelines.</p> <p>Possible effects to Native American sites at Big Hill, Bayou Choctaw, and West Hackberry, which could be mitigated.</p> | No impact. |
| Noise | <p>Noise from construction activities at the new and expansion sites would be audible, but the impacts would be minor.</p> <p>Noise from operations and maintenance activities would be audible only at the expansion storage sites, where the impacts would be minor.</p> <p>Noise from construction and operations and maintenance activities at the pipelines, terminals, and other infrastructure would have minor impacts.</p> | Similar noise impacts as under Bruinsburg alternative, except that noise from operations and maintenance activities at the new site would be audible, but the impacts would be minor. | Similar noise impacts as under Bruinsburg alternative. | Similar noise impacts as under Bruinsburg alternative. | Similar noise impacts as under Bruinsburg alternative. | Similar noise impacts as under Chacahoula alternative. | Similar noise impacts as under Chacahoula alternative. | No impact. |

Table S.6.11-1: Comparison of Impacts for Alternatives with Three Expansion Sites and No-Action Alternative

| Resource | Bruinsburg | Chacahoula | Clovelly | Clovelly 80 MMB/ Bruinsburg 80 MMB | Clovelly 90 MMB/ Bruinsburg 80 MMB | Richton | Stratton Ridge | No-Action |
|-----------------------|---|---|---|---|---|---|--|------------|
| Environmental Justice | The potentially affected populations include low-income, Black or African American, Native American or Alaska Native, Asian, and Hispanic or Latino populations. None of these populations would have impacts that appreciably exceed the impacts to the general population, or would be affected in different ways than the general population. Thus, there would be no disproportionately high and adverse impacts to low-income or minority populations. | Same environmental justice impacts as under Bruinsburg alternative. | Same environmental justice impacts as under Bruinsburg alternative. | Same environmental justice impacts as under Bruinsburg alternative. | Same environmental justice impacts as under Bruinsburg alternative. | Same environmental justice impacts as under Bruinsburg alternative. | Same noise impacts as under Bruinsburg alternative, except that the potentially affected communities also include Native Hawaiian or Other Pacific Islander communities. | No impact. |

1 acre = 0.404 hectares; 1 mile = 1.61 kilometers; square foot = 0.093 square meters; 1 gallon = 0.003785 cubic meters

Table S.6.11-2: Comparison of Impacts for Alternatives with Two Expansion Sites

| Resource | Bruinsburg | Chacahoula | Clovelly 80 MMB/ Bruinsburg 80 MMB | Clovelly 90 MMB/ Bruinsburg 80 MMB | Richton | Stratton Ridge |
|---|--|------------|---------------------------------------|---|---------|----------------|
| Environmental Risks and Public and Occupational Safety and Health | An increase of less than 0.1 predicted oil spills from the value presented in Table S.6.11-1. An increase of 7 more predicted oil spills than presented in Table S.6.11-1. No other notable changes. | * | * | A decrease of less than 0.2 predicted oil spills from the value presented in Table S.6.11-1. * | * | * |
| Land Use: Land Use Conflicts | A decrease of 81 acres from the value presented in Table S.6.11-1. No change in land use conflicts as presented in Table S.6.11-1. | * | * | * | * | * |
| Land Use: Visual Resources | No notable change from Table S.6.11-1. | * | * | * | * | * |
| Land Use: Farmland | A decrease of 120 acres of converted farmland from the value presented in Table S.6.11-1. | * | * | * | * | * |
| Land Use: Coastal Zone Management | The coastal zone associated with West Hackberry would not be affected. | * | * | * | * | * |
| Geology and Soils | No notable change from Table S.6.11-1. | * | * | * | * | * |
| Air Quality | No notable change from Table S.6.11-1. | * | * | * | * | * |
| Water Resources: Surface Water | The three water bodies at West Hackberry would not be affected by construction activities. | * | * | * | * | * |
| Water Resources: Groundwater | No additional risk to the sole-source aquifer from increased brine disposal at West Hackberry. | * | * | * | * | * |
| Water Resources: Floodplains | No notable change from Table S.6.11-1. | * | * | * | * | * |
| Biological Resources: Plants, Wetlands, and Wildlife | A decrease of 5 acres of affected wetlands from the value presented in Table S.6.11-1. | * | * | * | * | * |
| Biological Resources: Threatened and Endangered Species | * | * | * | * | * | * |
| Biological Resources: Special Status Areas | No notable change from Table S.6.11-1. | * | * | * | * | * |

Table S.6.11-2: Comparison of Impacts for Alternatives with Two Expansion Sites

| Resource | Bruinsburg | Chacahoula | Clovelly 80 MMB/ Bruinsburg 80 MMB | Clovelly 90 MMB/ Bruinsburg 80 MMB | Richton | Stratton Ridge |
|---|--|-------------------|---|---|----------------|-----------------------|
| Biological Resources: Essential Fish Habitat | No notable change from Table S.6.11-1. | * | * | * | * | * |
| Socioeconomics | A construction workforce at West Hackberry would not be required. No increase in operations and maintenance workforce at West Hackberry. No local economic benefits from increased employment. | * | * | * | * | * |
| Cultural Resources | No possible effects to Native American sites at West Hackberry. | * | * | * | * | * |
| Noise | No notable change from Table S.6.11-1. | * | * | * | * | * |
| Environmental Justice | No notable change from Table S.6.11-1. | * | * | * | * | * |

* Same impacts as under Bruinsburg alternative.

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List of Acronyms and Abbreviations

| | |
|-----------------|---|
| CAA | Clean Air Act |
| CAAA | Clean Air Act Amendments of 1990 |
| CEQ | Council on Environmental Quality |
| CFR | Code of Federal Regulations |
| CO | carbon monoxide |
| CWA | Clean Water Act |
| CZMA | Coastal Zone Management Act |
| DDE | dichlorodiphenylethylene |
| DDT | dichlorodiphenyltrichloroethane |
| DNA | deoxyribonucleic acid |
| DOE | U.S. Department of Energy |
| DOT | U.S. Department of Transportation |
| EFH | essential fish habitat |
| EIS | environmental impact statement |
| EPA | U.S. Environmental Protection Agency |
| EPACT | Energy Policy Act of 2005 |
| EPCA | Energy Policy and Conservation Act |
| ESA | Endangered Species Act |
| FERC | Federal Energy Regulatory Commission |
| FTA | Federal Transit Administration |
| HUD | U.S. Department of Housing and Urban Development |
| ICW | Gulf Intracoastal Waterway |
| LNG | liquid natural gas facilities |
| LOOP | Louisiana Offshore Oil Port |
| MMB | million barrels |
| MMBD | million barrels per day |
| MS | Minerals Management Service |
| MSA | Metropolitan Statistical Area |
| NAAQS | National Ambient Air Quality Standard |
| NEPA | National Environmental Policy Act |
| NMHC | non-methane hydrocarbons |
| NO ₂ | nitrogen dioxide |
| NO _x | nitrogen oxides |
| NOAA | National Oceanographic and Atmospheric Administration |
| NOI | Notice of Intent |
| NPDES | National Pollutant Discharge Elimination System |
| NRCS | Natural Resource Conservation Service |
| NSR | New Source Review |
| PM | particulate matter |
| ROW | right-of-way |
| RWI | raw water intake |
| SHPO | State Historic Preservation Officer |
| SPR | Strategic Petroleum Reserve |
| SWPA | source water protection area |
| USACE | U.S. Army Corps of Engineers |
| USDA | United States Department of Agriculture |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| VOC | volatile organic compounds |

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Glossary

To help readers more fully understand this Environmental Impact Statement, we have used bold type for technical and scientific terms, as well as plain English terms used differently in this context, the first time each appears in the text. This Glossary provides a full definition of each of those terms. In some cases, the definition of the term also appears in a highlighted box near the first occurrence of the term in the text.

| TERM | DEFINITION |
|-----------------------------------|---|
| 8-hour ozone standard | A national ambient air quality standard for ground-level ozone, the primary constituent of smog. The standard is set at 0.08 parts per million and is measured as the 3-year average of an annual 4th-highest daily maximum 8-hour ozone concentration. |
| A-weighted decibel (dBA) | A frequency-weighted noise unit that is widely used for traffic and industrial noise measurements. The A-weighted decibel scale approximates the frequency response of the human ear and thus correlates well with loudness. |
| Alluvial | Relating to, composed of, or found in the clay, silt, sand, gravel, or similar detritus material deposited by running water. |
| Anadromous fish | Fish that spend most of their lives in salt water but migrate into freshwater tributaries to spawn (e.g., Gulf sturgeon and Alabama shad). |
| Anhydrite | A mineral, anhydrous calcium sulfate (chemical formula CaSO_4), occurring naturally in salt deposits. Anhydrite is much less soluble than salt, so anhydrite solids must be removed from brine before the brine can be disposed of in the ocean or injected into underground wells. |
| Aquifer | A body of rock or soil that is capable of transmitting groundwater and yielding usable quantities of water to wells or springs. |
| Base flood | A flood that has a 1 percent chance of occurrence in any given year (also known as a 100-year flood). |
| Basement fault | The fault that displaces basement rocks (metamorphic and igneous rocks underlying the sedimentary rocks) and originated prior to deposition of overlying sedimentary rocks. Such faults may or may not extend upward into overlying strata, depending upon their history of rejuvenation. |
| Bathymetry | The measurement of water depths in oceans, seas, and lakes. |
| Benthic organism (benthos) | A form of aquatic plant or animal life that is found on or near the bottom of a stream, lake, or ocean. |
| Berm | A horizontal, narrow ledge at the bottom or top of an embankment used to stabilize the slope by intercepting sliding earth. |

| TERM | DEFINITION |
|-------------------------------|--|
| Borehole | A hole made by drilling into the ground to study stratification, to release underground pressures, or to construct a production well, a disposal well, or a storage cavern in salt rock. |
| Brine | Water with a salt concentration greater than 35 parts per thousand. Sea water has a similar average concentration. In comparison, discharged brine has a typical concentration of 263 parts per thousand. |
| Brine pond | Lined pond where brine is disposed and impounded so that solids and contaminants, such as oil, can settle. |
| Bulkhead | Retaining walls designed to hold or prevent the sliding of soil caused by erosion and wave action. |
| Caliper | An instrument used to measure the diameter of a drill hole to determine the hardness or softness of the individual rocks. |
| Caliper pig | An electronic device that moves through the inside of a pipeline to determine by acoustical means the thickness of the pipeline wall. |
| Candidate species | Plants and animals native to the United States for which the U.S. Fish and Wildlife Service or the National Marine Fisheries Service has sufficient information on biological vulnerability and threats to justify proposing addition to the threatened and endangered species list, but cannot do so immediately because other species have a higher priority for listing. The Services determine the relative listing priority of candidate species in accordance with general listing priority guidelines published in the <i>Federal Register</i> . (See endangered species and threatened species.) |
| Canopy | Overhanging plants shading the surface below them (such as large trees). |
| Caprock | A layer of rock that is often found covering some or all of a salt dome. Caprock is chemically derived rock composed of anhydrite and other insoluble components of the salt that remain when the salt is washed away by groundwater and other forces. |
| Casing | Steel pipe used in oil wells to seal off fluids from the borehole and to prevent the walls of the hole from sloughing off or caving. There may be several strings of casing in a well, one inside the other. |
| Cavern | An underground chamber or cavity created in a salt dome by solution mining and used for storing the petroleum. |
| Clay | Soil consisting of inorganic material, the grains of which have diameters smaller than 0.005 millimeters. |
| Concentric cased wells | Concentric cased wells are two wells, one located within the other. The two wells are separated by an inner casing and an outer casing, and the casings form two concentric rings. |

| TERM | DEFINITION |
|--------------------------------------|--|
| Creep | In engineering usage, creep is any general, slow displacement under load. |
| Critical habitat | Habitat essential to the conservation of an endangered or threatened species that has been designated so by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR Part 424). The lists of critical habitats can be found in 50 CFR 17.95 (fish and wildlife), 50 CFR 17.96 (plants), and 50 CFR 226 (marine species). |
| Crustaceans | A class of aquatic invertebrate organisms with a hard external skeleton. |
| Day Night Average Noise Level | A 24-hour average of noise levels. |
| Decibel (db) | A unit for expressing the relative intensity of sounds on a logarithmic scale from zero (the average least perceptible sound) to about 130 (the average level at which sound causes pain to humans). |
| Design value | A pollutant concentration, based on ambient measurement, which describes the air quality status of a given area. Areas in which the design value exceeds the NAAQS may result in a nonattainment designation for the area. |
| Diffuser | The structure at the end of a pipeline that disperses an effluent discharge into a receiving water body by the action of jet dilution through a series of ports. |
| Drawdown | The process of removing oil from a storage cavern by displacing the oil with water or brine. |
| Drilling mud | A mixture of clays, chemicals, and water that is pumped down a drill pipe to lubricate and cool the drilling bit, to flush out the cuttings, and to stabilize the sides of a hole being drilled. |
| Easement | An easement is a right held by one party to make specific, limited use of land owned by another party. An easement is granted by the owner of the property for the convenience or ease of the party using the property. Common easements include the right to pass across the property or the right to construct a pipeline under the land or a power line over the land. |
| Ecoregion | A region containing relatively similar ecological systems as determined by variations in climate, vegetation, and landform. |
| Ecosystem | A community of organisms and their physical environment interacting as an ecological unit. |

| TERM | DEFINITION |
|---------------------------|---|
| Endangered species | Plants or animals that are in danger of extinction through all or a significant portion of their habitat ranges and that have been listed as endangered by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR Part 424). The lists of endangered species can be found in 50 CFR 17.11 (wildlife), 50 CFR 17.12 (plants), and 50 CFR 222.23(a) (marine organisms). The states considered in this EIS also list species as endangered. |
| Estuarine system | Deep water habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean. Ocean water is at least occasionally diluted by freshwater runoff from the land, and their interplay results in a nutrient trap making the estuarine system more productive than either freshwater or marine systems. |
| Estuary | A semi-enclosed coastal body of water which has a free connection with the open sea and within which seawater is measurably diluted with fresh water. |
| Floodplains | The lowlands and relatively flat areas adjoining inland and coastal waters with the flood-prone areas of offshore islands. Floodplains include, at a minimum, that area with at least a 1-percent chance of being inundated by a flood in any given year. |
| Fluvial deltaic | Produced by the action of a stream or river and in the typical form of the Greek letter delta. |
| Geophysics | The physics of the Earth and its environment, including the physics of fields such as meteorology, oceanography, and seismology. |
| Growth fault | A type of normal fault that develops and continues to move during sedimentation and typically has thicker strata on the downthrown, hanging wall side of the fault than in the footwall. Growth faults are common in the Gulf of Mexico and in other areas where the Earth's crust is subsiding rapidly or being pulled apart. |
| Grubbing | Clearing of land by digging up roots or stumps. |
| Historic property | As defined in 36 CFR 800.16 of the National Historic Preservation Act, "historic property means any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meets the National Register criteria." |

| TERM | DEFINITION |
|--|---|
| Hydrostatic test | Test of strength and leak-resistance of a vessel, pipe, or other hollow equipment using internal pressurization with a test liquid. |
| In-migration | The movement of people into a given geographic area. |
| Invertebrate | An animal lacking a backbone and internal skeleton. |
| Level equivalents (Leq) | Level of noise (in decibels) averaged over a period of time. |
| Laydown yard | Storage area for equipment and materials to be used for maintenance or construction. |
| Lithic scatter | A distribution of cultural items that consists primarily of lithic (i.e., stone) material. The scatter may include formed tools such as points or knives, or it may contain only chipping debris from tool-making activities. |
| Marsh | A transitional land-water area with more or less continuously waterlogged soil characterized by aquatic and grass-like vegetation, but without an accumulation of peat. |
| Metropolitan Statistical Area (MSA) | A metropolitan statistical area is an area containing a recognized population nucleus (such as a city) and adjacent communities (sometimes considered suburbs) that have a high degree of integration with that nucleus. One of the major purposes in defining MSAs is to provide a nationally consistent definition for collecting, tabulating, and publishing federal statistics for a set of geographical areas. |
| Midden soil | Soil that has been changed by long-term human occupation; it typically contains bits of charcoal and other organic materials derived from human use. Midden soil is often darker in color and has a looser texture than surrounding soils. Archaeologists consider midden soil as evidence that a site was used for long-term residence or revisited regularly over many years, rather than reflecting short-term activities. |
| Normal fault | A fault in which the hanging wall has apparently gone down with relation to the footwall. |
| Oil blanket | A quantity of oil that is used during the development of storage caverns in salt domes. The oil is injected into the cavern, where it floats on top of the water used during solution mining and blankets the cavern roof, thereby preventing the water from dissolving salt at the top of the cavern. |
| Overhang | The part of the salt that projects out laterally from the top of a salt dome and is like the cap of a mushroom. |
| Overstory | The tallest spatially dominant species in a forest; usually composed of coniferous or deciduous tree species. |
| Palustrine | Of, pertaining to, or living in, a marsh or swamp; marshy. |

| TERM | DEFINITION |
|---------------------------|---|
| Palustrine wetland | All non-tidal wetlands dominated by trees, shrubs, or persistent emergent vegetation. Includes wetlands traditionally called marshes, swamps, or bogs. |
| Particulate matter | Any material suspended in the air in the form of minute solid particles or liquid droplets, especially when considered as an atmospheric pollutant. A number following denotes the upper limit of the diameter of particles included. Thus, PM10 includes only those particles equal to or less than 10 micrometers (0.0004 inch) in diameter; PM2.5 includes only those particles equal to or less than 2.5 micrometers (0.0001 inch) in diameter. |
| Perennial | A plant with a lifespan of two or more years. |
| Permeability | Capacity for transmitting a fluid a given distance through an interval of time. |
| Piercement | A dome or anticlinal fold in which a mobile plastic core (i.e., salt) has ruptured the more brittle overlying rock. Also known as a diapir, dipiric fold, piercement dome, or piercing fold. |
| Pig | A cylindrical device (3- to 7-feet long) inserted in a pipeline for the purpose of sweeping the line clean of water, rust, or other foreign matter. |
| Pigging | In pigging operations, inspection and cleaning devices called pigs are sent through pipelines to check the condition of pipelines and clean them. Caliper pigging is used to determine the thickness of pipeline walls. |
| Plankton | Passively floating or weakly mobile, microscopic aquatic plants (phytoplankton) and animals (zooplankton). |
| Plug | To fill a well's borehole with cement or other impervious matter to prevent the flow of water, gas, or oil from one strata to another when a well is abandoned; to place a permanent obstruction at the junction of a saline water body and pipeline ROW to prevent salt water intrusion into fresh water or to prevent the formation of new water courses. |
| Radial Fault | A fault belonging to a system that radiates from a point. |
| Raw water | Raw water is fresh surface water or salt water that is supplied to a site from a substantial water source. |
| Right-of-way (ROW) | The right held by one person over another person's land for a specific use; rights of tenants are excluded. The strip of land for which permission has been granted to build and maintain a linear structure, such as a road, railroad, pipeline, or transmission line. |
| Rip rapping | Rip rapping is the process by which rocks or other materials (rip rap) are placed along the banks of a body of water to prevent erosion. |

| TERM | DEFINITION |
|----------------------------|---|
| Riverine | Relating to, formed by, or resembling a river. |
| Rock salt formation | See salt dome. |
| Salinization | To treat or impregnate with salt. |
| Salt dome | A subsurface geologic structure consisting of a vertical cylinder of salt that may be anywhere from 0.5 to 6 miles (1 to 10 kilometers) across and up to 20,000 feet (6,100 meters) deep. Domes are formed when salt from buried salt pans flows upward due to its buoyancy. |
| Scrub-shrub | Areas dominated by woody vegetation less than 6 meters (20 feet) tall, which includes true shrubs and young trees. |
| Seismic | Related to the activity of naturally or artificially induced earthquakes or earth vibrations, where the seismic waves are the elastic waves produced by these vibrations. |
| Shear zone | A tabular area of rock that has been crushed and broken into fragments by many parallel fractures resulting from shear strain; often becomes a channel for underground fluids and the seat of ore deposition. |
| Shell middens | A subtype of midden soil that has been altered by human occupation. Shell midden includes large amounts of fragmented mollusk shell mixed with charcoal and other organic materials derived from human use. Archaeologists interpret shell midden sites as the result of long-term residence or regular reuse, where the debris from a shellfish-rich diet has become part of the site. |
| Shell scatters | Distributions of cultural material that consist primarily of shell fragments. Shell scatters do not contain the visibly and texturally different soil of shell middens, and they are interpreted as the result of short-term use or use for only a single activity (such as shellfish harvesting) rather than residence. |
| Silt | Soil consisting of inorganic material, the grains of which have diameters between 0.0625 mm and 0.2 mm. |
| Skimmers | A self-propelled, boat-like oil spill clean-up device that removes spilled oil from the surface of a water body into a tank. |
| Soil liquefaction | Process that occurs when saturated sediments are shaken by an earthquake. The soil can lose its strength and cause the collapse of structures with foundations in the sediment. |
| Solution mining | The process of creating space in rock salt by dissolving the salt with injected water and removing the resultant brine. |

| TERM | DEFINITION |
|--|---|
| Special status species | State and Federally listed threatened, endangered, and candidate species; marine mammals; migratory birds; federally managed fisheries; and Forest Service's Regional Forester Sensitive Species. |
| Spoil | Dirt or rock that has been removed from its original location, destroying the composition of the soil in the process. |
| Spud barge | A flat-decked floating structure that has devices similar to legs, called spuds, which are lowered from underneath the barge and pushed into the waterway floor to anchor the structure in place. |
| Stratigraphic | Dealing with the origin, composition, distribution, and succession of geological strata. |
| Subsidence | The geological sinking or downward settling of an area on the Earth's surface, resulting in the formation of a depression. |
| Sump | The space below the bottom end of a well pipe where liquid collects. |
| Surfactant | A soluble compound that reduces the surface tension of liquids, or reduces interfacial tension between two liquids or a liquid and a solid. |
| Tank farm | A facility that temporarily stores petroleum in large tanks connected to a pipeline. |
| Threatened species | Any plants or animals that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their habitat ranges and which have been listed as threatened by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures set out in the Endangered Species Act and its implementing regulations (50 CFR Part 424). (See endangered species.) The lists of threatened species can be found at 50 CFR 17.11 (wildlife), 17.12 (plants), and 227.4 (marine organisms). The states considered in this EIS also list species as threatened. |
| Understory | Low-lying vegetation growing beneath the overstory of a forest; usually composed of herbaceous plants, shrubs, and small saplings. |
| Uplands | Generally dry land that is different from lowlands, marsh, swamp, and wetlands. |
| Volatile organic compound (VOC) | Any organic compound that participates in atmospheric photochemical reactions; also a nationally regulated air pollutant. |

TERM

DEFINITION

Wetlands

An area that is inundated by surface water or groundwater with a frequency sufficient to support, and under normal circumstances would support, a prevalence of vegetative or aquatic life that requires saturated- or seasonally saturated-soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas (e.g., sloughs, potholes, wet meadows, river overflow areas, mudflats, and natural ponds).

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